REPORT RESUMES

ED 011 112 AL 000 099

ABLAUT IN GERMAN STRONG VERBS.

BY- ROSS, JOHN ROBERT

EDRS PRICE MF-$0.18 HC-$3.76 94P.

DESCRIPTORS- *GERMAN, *VERBS, PHONOLOGY, *TRANSFORMATION THEORY (LANGUAGE), SYNTAX, MORPHOLOGY (LANGUAGES),

AN ANALYSIS OF ABLAUT IN GERMAN VERBS IS DEVELOPED WITHIN THE FRAMEWORK OF TRANSFORMATIONAL GENERATIVE GRAMMAR. THE HYPOTHESIS STATES THAT IF A VERB STEM IS KNOWN NOT TO BE REGULAR, THE TYPE OF ABLAUT IT UNDERGOES CAN TO A LARGE EXTENT BE PREDICTED ON THE BASIS OF SYNTACTIC OR PHONOLOGICAL FEATURES. THE FORMS ACCOUNTED FOR ARE ALL THE IRREGULAR VERB STEMS ON PAGES 805-812 IN "CASSELL'S NEW GERMAN AND ENGLISH DICTIONARY," (1939 EDITION). HALLE'S THEORY OF PHONOLOGY IS USED , AS WELL AS CHOMSKY'S NOTION OF THE COMPLEX SYMBOL. TYPES OF ABLAUT ARE EXAMINED AND A SYSTEM OF FEATURES IS DEVELOPED TO CLASSIFY THE PRINCIPAL PARTS OF THE VERBS. (KL)

ED011111

Errata sheets appended

ABLAUT IN GERMAN STRONG VERBS*

JOHN ROBERT ROSS, MIT

AL 000 099

0.0. Introduction

Most verb stems in modern High German are conjugated like arbeiten 'work' and its derivatives (verarbeiten 'process', erarbeiten 'gain through work', um-arbeiten 'rework', etc.). I enclose underlying forms between slanting lines, and phonetic forms in square brackets.

Present Tense

	Singular	Plural
1st	[ắrbăytə̆] (from /ărbăyt+ĕ/)	[ắrbăytn] (from /ărbăyt+ĕn/)
2nd	[ắrbăytəst] (from /ărbăyt+ĕst/)	[ắrbăytə̆t] (from /ărbăyt+ĕt/)
3rd	[ắrbăytə̆t] (from /ărbăyt+ĕt/)	[ắrbăytṇ] (from /ărbăyt+ĕn/)

Past Tense

1st	[ắrbăytə̆tə̆] (from /ărbăyt+ĕt+ĕ/)	[ắrbăytə̆tṇ] (from /ărbăyt+ĕt+ĕn/)
2nd	[ắrbăytə̆tə̆st] (from /ărbăyt+ĕt+ĕst/)	[ắrbăytə̆tə̆t] (from /ărbăyt+ĕt+ĕt/)
3rd	[ắrbăytə̆tə̆t] (from /ărbăyt+ĕt+ĕt/)	[ắrbăytə̆tṇ] (from /ărbăyt+ĕt+ĕn/)

Past Participle

[gə̆ʔắrbăytə̆t] (from /gĕ+ărbăyt+ĕt/)

In the case of verbs like fehlen 'miss, lack', whose stem end in a segment other than t or d, rules of syncope[1] drop unstressed e (providing certain non-permitted clusters do not thereby arise) to yield a paradigm only superficially different from that of arbeiten:

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

Present

	Singular	Plural
1st	[fḗlə̆][2] (from /fēl+ĕ/)	[fḗlṇ] (from /fēl+ĕn/)
2nd	[fḗlst] (from /fēl+ĕst/)	[fḗlt] (from /fēl+ĕt/)
3rd	[fḗlt] (from /fēl+ĕt/)	[fḗlṇ] (from /fēl+ĕn/)

Past

1st	[fḗltə̆] (from /fēl+ĕt+ĕ/)	[fḗltṇ] (from /fēl+ĕt+ĕn/)
2nd	[fḗltə̆st] (from /fēl+ĕt+ĕst/)	[fḗltə̆t] (from /fēl+ĕt+ĕt/)
3rd	[fḗltə̆] (from /fēl+ĕt+ĕ/)	[fḗltṇ] (from /fēl+ĕt+ĕn/)

Past Participle

[gəfēlt] (from /ge+fēl+et/)

This type of regular, or "weak", verb exhibits no vowel or consonant alternations of interest and will not concern us further.

Irregular, or "strong", verbs exhibit two types of vowel alternation, Ablaut and Umlaut.[3] I will propose an analysis only of the former type.

The forms I attempt to account for are all the irregular verb stems listed on pages 805-812 in the 1939 edition of Cassell's New German and English Dictionary. That some of the verbs are obsolete, or are now declined regularly, is not relevant for my purpose: the above analysis would then not be of contemporary German, but rather of the German of 25 or 50 years ago, which formed the basis for Cassell's list. The question of whether klieben should or should not be considered to be part of contemporary German, or of whether fragen has a strong or a weak stem, does not interest me as much as does the question of what consequences either assumption would have upon the kind of rules in the resulting grammar. I believe it to be the case that while some of the verbs in Cassell are now conjugated regularly (e.g., *fragen*, *hauen*, *verhehlen*, etc.), there are no strong verbs which are not listed there. That is, I believe that whatever the actual list of strong verbs in contemporary German may be, it is some subset of the list in Cassell, and thus, *a fortiori*, will be taken account of in my analysis.

0.1. The present analysis is within the framework of transformational generative grammar as developed by Chomsky and others at MIT during the past decade.[4] In particular, it makes use of Halle's theory of phonology[5] and Chomsky's notion of the complex symbol.[6] It is the purpose of this paper to show that although stems must be marked as to whether or not *Ablaut* occurs (I will use the abstract feature [± Reg] for this purpose), given that a stem is known to be [-Reg], the particular type of *Ablaut* it undergoes can be predicted to a large extent on the basis of syntactic or phonological features.

In §1, I will discuss the various types of *Ablaut* and the major rules affecting vowels. In §2, I will restate in maximally simple form the various redundancy rules touched upon in §1; and §3 contains a list of all verb stems which I must treat as suppletive and a summary. The Appendix contains an ordered list of all rules discussed in the text.

0.2. The inventory of underlying segments that I will use is given in the distinctive-feature matrices below. These matrices are highly redundant; but I do not know enough about German phonology at present to write a complete set of morpheme structure rules which would take advantage of all the redundancies. Therefore, these matrices should not be thought of as having any systematic significance; rather they are included here only for expository purposes for readers unfamiliar with Jakobsonian distinctive features.

	p	b	m	f	v	t	d	n	s	z	š	k	g	x	γ	r	l	y	w
consonantal	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-
vocalic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-
grave	+	+	+	+	+	-	-	-	-	-	-	+	+	+	+	+	-	-	+
diffuse	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	+	+	+
continuant	-	-	-	+	+	-	-	-	+	+	+	-	-	+	+	+	-	+	+
nasal	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
voiced	-	+	+	-	+	-	+	+	-	+	-	-	+	-	+	+	+	+	+
obstruent	+	+	-	+	+	+	+	-	+	+	+	+	+	+	+	-	-	-	-
strident	-	-	-	+	+	-	-	-	+	+	+	-	-	+	+	-	-	-	-

	ī	ĭ	ū	ŭ	ē	ĕ	ō	ŏ	ā	ă
consonantal	-	-	-	-	-	-	-	-	-	-
vocalic	+	+	+	+	+	+	+	+	+	+
grave	-	-	+	+	-	-	+	+	+	+
diffuse	+	+	+	+	-	-	-	-	-	-
compact	-	-	-	-	-	-	-	-	+	+
flat	-	-	+	+	-	-	+	+	-	-
long	+	-	+	-	+	-	+	-	+	-
obstruent	-	-	-	-	-	-	-	-	-	-

I propose to represent the affricates [p͡f], [c] and [č] as the sequences /pf/, /ts/ and /tš/ respectively. It is unnecessary to postulate an underlying /h/, since [x] and [h] are in complementary distribution and [h] can therefore be represented as /x/.

I have proposed an underlying /γ/ as a reasonably simple means of accounting for such alternations as the following:

sehen	'see'	-	Sicht	'sight'
geschehen	'happen'	-	Geschichte	'history'
Höhe	'height'	-	hoch	'high'
nahe	'near'	-	nächst	'next'

fliehen	'flee'	-	*Flucht*	'flight'
schmähen	'revile'	-	*Schmach*	'insult'

General rules of cluster devoicing and devoicing in syllable final position (except before vowels) will convert /ɣ/ into the phonetic [x] or [ç] which appears in the forms in the right-hand column. Any instances of [ɣ] which remain can then be deleted. What makes such a solution undesirable is the fact that it leaves an inventory with only one underlying voiced fricative, a velar (the treatment of phonetic [z] and [v] will be discussed below), and such systems must probably be ruled out by universal conditions which characterize the set of possible inventories of underlying segments. Also, there are many other puzzling alternations involving velars in German, e g., *ziehen* 'pull' - *Zug* 'train', *bringen* 'bring' (inf.) - *brachte* 'I brought', *denken* 'think' (inf) - *dachte* 'I thought', and the question of whether postulating a /ɣ/ is the optimal method of accounting for the alternations first mentioned above cannot be resolved until an intensive study of all velar alternations has been made Since I have not carried out such a study, my proposal to include a /ɣ/ in the inventory is highly tentative.

A more detailed treatment of German phonology would probably reduce the above inventory in the following ways: [y] and [w] would be treated as variants of /ĭ/ and /ŭ/, and [v] would be a pre-vocalic variant of the latter phoneme Phonetic [s], as in *reissen* 'tear', would be represented as /ss/, while phonetic [z], as in *reisen* 'travel', would derive from /s/ by means of a rule voicing /s/ except after obstruents. Phonetic [š] before consonants in morpheme-initial position would derive from underlying /s/ by means of a palatalization rule, and in other positions, [š] would derive from /sk/ by means of the palatalization rule and a subsequent rule to delete the /k/.

But since my main concern in this paper is vowel alternation phenomena, I will do no more than suggest this deeper analysis here, for to justify it in detail would go far beyond the bounds of this paper, and the facts of Ablaut do not depend on the analysis of consonants except peripherally.

The omission of umlauted vowel~~s~~ is the only remaining fact of the inventory which requires comment. In the conjugations of irregular verbs, all umlauted vowels (i.e. $\begin{bmatrix}-\text{grv}\\+\text{flt}\end{bmatrix}$ vowels) alternate with non-umlauted vowels, and, since a rule umlauting vowels must be in the grammar for independent reasons, it is simplest to set up base forms with non-umlauted vowels and to derive all umlauted vowels. So for irregular verbs, at least, it is not necessary to set up the underlying segments /ǖ/, /ü̆/, /ȫ/, and /ǣ/.

An interesting problem, which I would like to bring up, but will have to leave unsolved because of lack of knowledge, is the following: should underlying segments /ǖ/, /ü̆/, /ȫ/, and /ǣ/ be set up in German at all? I have not made an exhaustive search through a dictionary to see how many instances there are in German of morphemes containing umlauted vowels which do not alternate with non-umlauted ones, but a preliminary investigation suggests that there are probably around two hundred of these. Since this is the case, the simplest solution might be to mark these morphemes so that the umlaut rule obligatorily applies to them in all contexts and to set up for the whole of German the 5-vowel system which I propose for the strong verbs. This proposal is, of course, highly speculative, and must await further study before any decision can be reached.

1.0. Types of Ablaut

Most ablauting occurs in verb conjugations, but there is some which arises in derivational processes (e.g., in the formation of deverbal nouns such as fliegen - Flug, singen - Gesang, sehen - Sicht, etc). I will restrict my remarks to the ablauting which occurs in verbal paradigms except insofar as derivational ablauting sheds some light on verbal patterns.

Consider the following ten types of vowel alternation in verb conjugations:[7]

Type 1 a. ĭ-ă-ŭ: sĭngen, săng, gesŭngen, sĭngt 'sing'
cf. also fĭnden 'find', trĭnken 'drink', etc
b. ĭ-ă-ŏ: begĭnnen, begănn, begŏnnen, begĭnnt 'begin
cf. also schwĭmmen 'swim', gewĭnnen 'win', etc.

Type 2 a. ī-ō: bīegen, bōg, gebōgen, bīegt 'bind'
cf. also flīegen 'fly', flīehen 'flee', wīegen 'weigh', etc.
b. ī-ŏ: flīessen, flŏss, geflŏssen, flīesst 'flow'
cf. also rīechen 'smell', trīefen 'drip', etc.

Type 3 a. a-ī-ä: făllen, fīel, gefăllen, fällt 'fall'
cf. also brāten 'fly', hălten 'hold', etc.
b. a-ū-ä: trāgen, trūg, getrāgen, trāgt 'carry'
cf. also fāhren 'drive', grāben 'dig', etc.

Type 4 4 Vowel: hĕlfen, hălf, gehŏlfen, hĭlft 'help'
cf. also bĕrgen 'conceal', nēhmen 'take', etc.

Type 5 a. i-e-o: drĕschen, drŏsch, gedrŏschen, drĭscht 'thresh
cf. also fĕchten 'fence', schmĕlzen 'melt', etc.
b. e-o: heben, hōb, gehōben, hēbt 'lift'
cf. also bewēgen 'move', wēben 'weave', etc.

Type 6 a. ē-ā-ī: lēsen, lās, gelēsen, līest 'read'
cf. also sēhen 'see', gēben 'give', etc.
b. ĕ-ā-ĭ: frĕssen, frāss gefrĕssen, frĭsst 'gobble'
cf. also ĕssen eat', mĕssen 'measure', etc.

c i-ā-ē-ī: līegen, lāg, gelēgen, līegt 'lie'

cf. also bĭtten 'request'

Type 7 Diphthongs

a. ay-ī: bleiben, blīeb, geblīeben, bleibt 'stay'

cf. also meiden 'avoid', schweigen 'be silent', etc.

b. ay-ĭ: beissen, bĭss, gebĭssen, beisst 'bite'

cf. also kneifen 'pinch', reiten 'ride', etc.

c. aw-ō: saugen, sōg, gesōgen, saugt, 'suck'

cf. also schnauben 'snort', schrauben 'screw'

d. aw-ŏ(- ɔy): saufen, sŏff, gesŏffen, säuft 'swill'

Type 8 ĕ-ă: brĕnnen, brănnte, gebrănnt, brănnt 'burn'

cf. also dĕnken 'think', sĕnden 'send'

Type 9 Modals

dü̆rfen, dŭrfte, gedŭrft, dărf 'be allowed to'

kö̆nnen, kŏnnte, gekŏnnt, kănn 'be able to'

mȫgen, mŏchte, gemŏcht, māg 'may'

mü̆ssen, mŭsste, gemŭsst, mŭss 'have to'

sŏllen, sŏllte, gesŏllt, sŏll 'ought to'

wŏllen, wŏllte, gewŏllt, wĭll 'want to'

Type 10 Umlaut in Infinitive

a. lǖgen, lōg, gelōgen, lǖgt 'lie'

cf. also -trǖgen (betrǖgen 'deceive')

b. schwȫren, schwōr, geschwōren, schwȫrt 'swear'

c. lö̆schen, lŏsch, gelŏschen, lĭscht 'extinguish'

d. -wǟgen, -wōg, -wōgen, wǟgt (cf. erwǟgen 'consider')

cf. also schwǟren 'suppurate', gǟren 'ferment'

1.1. Let us examine Type 1 verbs first. There are 18 verbs which exhibit this type of vowel alternation:

binden 'bind', dingen 'employ', dringen 'urge',
finden 'find', -ling (cf. gelingen 'suceeed') klingen 'sound'
ringen 'struggle', schlingen 'make a loop', schwinden 'vanish',
schwingen 'swing', singen 'sing', sinken, 'sink',
springen 'spring', stinken 'stink', trinken 'drink',
winden 'wind', wringen 'wring', zwingen 'force'

In addition, there are 2 verbs which differ from these only in that in the past tense they have the vowel $\check{u}$ instead of $\check{a}$:

schinden, schund, geschunden, schindet 'flay'
schrinden, schrund, geschrunden, schriudet 'chap, crack'

Inspection of these 20 verbs reveals that in all cases, the stem is $/C^{2}_{1}\ \check{i}\ [+\text{nsl}]\ C^{1}_{1}/$.[8] This suggests the hypothesis that all verbs whose stem is of this form have the ablaut pattern i~a~u~i.[9] The only apparent counter-example is bringen 'bring', and motivation will be given below for considering that this stem has the underlying representation /brěng/ (cf. §1.61).

Now let us examine the Type 1b stems:

-ginnen (cf. beginnen 'begin')
rinnen 'run (of water)' schwimmen 'swim', sinnen 'meditate',
spinnen 'spin'

These differ from Type 1a only in that their base forms are of the form $/C^{2}_{1}\ \check{i}\ [+\text{nsl}]/$. We see that both Type 1a and 1b can be reduced to the same type if the grammar contains rule (1) and (2):[10]

$$(1)\quad \begin{bmatrix} \text{V} \\ \text{-grv} \\ \text{+diff} \\ \text{-Reg} \end{bmatrix} \rightarrow \begin{bmatrix} \text{+Past = a} \\ \text{+PP = u} \\ \text{+3rd present = i} \end{bmatrix} \;/\; \text{—}\;\; [\text{+nsl}]$$

$$(2)\quad \begin{matrix} \text{V} \\ \text{+grv} \\ \text{+diff} \\ \text{-Reg} \\ \text{+PP} \end{matrix} \rightarrow [\text{-diff}] \;/\; \text{—}\; [\text{+nsl}] +$$

Thus we would derive gefunden 'found' and begonnen 'begun' as follows:

$$\text{gefunden:}\quad \text{base form}\quad \begin{bmatrix} \text{/find/} \\ \text{+PP} \end{bmatrix} \xrightarrow{\text{Spelling rule}} \begin{bmatrix} \text{ge+} & \text{fund} & \text{+en} \\ & \text{+PP} & \end{bmatrix}$$

$$\xrightarrow{2} \text{(blocks)} \rightarrow [\text{gef}\check{\text{u}}\text{nden}]$$

$$\text{begonnen:}\quad \text{base form}\quad \begin{matrix} \text{/be+gin/} \\ \text{+PP} \end{matrix} \xrightarrow{\text{Spelling rule}} \begin{bmatrix} \text{be+} & \text{gun} & \text{+en} \\ & \text{+PP} & \end{bmatrix}$$

$$\xrightarrow{2} [\text{beg}\check{\text{o}}\text{nen}]$$

1.2. Consideration of the following exhaustive list of verbs of Types 2a and 2b and certain deverbal nouns related to them lends further support to rule (2):

a. b$\overline{\text{ie}}$gen 'bend', Bǔcht 'bay', (?) Būg 'bow (of a ship)', Bogen 'bow, arch'

b$\overline{\text{ie}}$ten 'offer' (Angebōt 'offer')

fl$\overline{\text{ie}}$gen 'fly' Flūg 'flight'

fl$\overline{\text{ie}}$hen 'flee' Flǔcht 'flee'

fr$\overline{\text{ie}}$ren 'freeze' (Frǒst 'frost')

(obs.)k$\overline{\text{ie}}$sen 'choose' ---

-*līeren* (cf. *verlīeren* 'lose') *Verlǔst* 'loss'

schīeben 'shove' *Schǔb* 'shove'

stīeben 'kick up (of dust)' ---

wīegen 'weight' *Wǔcht* 'weight, burden'

zīehen 'pull' *Zǔg* 'train', (?) *Zǔcht* 'training, breeding'

b. -*drīessen* (cf. *verdrīessen* 'make unhappy') *Verdrǔss* 'trouble'

flīessen 'flow' *Flǔss* 'river'

gīessen 'pour' *Gǔss* 'pouring (of a statue)'

krīechen 'creep' --

-*nīessen* (cf. *genīessen* 'enjoy') *Genǔss* 'pleasure'

rīechen 'swell' *Gerǔch* 'swell'

(obs.) *schlīefen* 'creep into'

schlīessen 'close' *Schlǔss* 'end', *Schlǒss* 'lock'

(also reg.) *sīeden* 'boil' ---

sprīessen 'bud' (*Sprǒss* 'bud')

trīefen 'drip' ---

Inspection of all other verb stems reveals that with one exception[12], all verbs in īC exhibit the same alternations as *bīegen*. This suggests the redundancy rule

$$(3)\qquad \begin{bmatrix} \text{V} \\ \text{-grv} \\ \text{+diff} \\ \text{+long} \\ \text{-Reg} \end{bmatrix} \rightarrow \begin{bmatrix} \text{+Pst} = \text{o} \\ \text{+PP} = \text{o} \\ \text{+Pres} = \text{i} \end{bmatrix}$$

1.21. It is now necessary to go into the system of features which I will use to classify the principal parts of all strong verbs. I propose the following 3 features:

[± Stem = PP] The stem and past participle have/do not have the same vowel.

[± Pst = PP]	The past tense and the past participle have/do not have the same vowel.
[± Prs Um]	"umlaut in present" - The stem and the 3rd person singular present have/do not have the same vowel.

Thus, the first eight ablaut types listed above in 1.0 will be classified as follows:

Type 1:	i-a-u/o-i	[-Stem = PP, -Pst = PP, -Prs Um]
Type 2:	i-ō/ŏ-ō/ŏ-i	[-Stem = PP, +Pst = PP, -Prs Um]
Type 3:	a-ī/ū-a-ä	[+Stem = PP, -Pst = PP, +Prs Um]
Type 4:	e-a-o-i	[-Stem = PP, -Pst = PP, +Prs Um]
Type 5:	e-o-o-i	[-Stem = PP, +Pst = PP, +Prs Um]
Type 6:	e-ā-e-i	[+Stem = PP, -Pst = PP, +Prs Um]
Type 7:	ay-ī/ĭ-ī/ĭ-ay aw-ō/ŏ-ō/ŏ-aw	[-Stem = PP, +Pst = PP, -Prs Um]
Type 8:	e-a-a-e	[-Stem = PP, +Pst = PP, -Prs Um]

We must therefore revise (1) and (3) as (1') and (3') respectively

$$(1')\quad \begin{bmatrix}\text{V}\\ -\text{grv}\\ +\text{diff}\\ -\text{Reg}\end{bmatrix} \rightarrow \begin{bmatrix}-\text{Stem} = \text{PP}\\ -\text{Pst} = \text{PP}\\ -\text{Prs Um}\end{bmatrix} \;/\; \text{---}\; [+\text{nsl}]$$

$$(3')\quad \begin{matrix}\text{V}\\ -\text{grv}\\ \begin{bmatrix}+\text{diff}\\ +\text{long}\\ -\text{Reg}\end{bmatrix}\end{matrix} \rightarrow \begin{bmatrix}-\text{Stem} = \text{PP}\\ +\text{Pst} = \text{PP}\\ -\text{Prs Um}\end{bmatrix}$$

(1') and (3') collapse into one rule:

$$(1'')\quad \begin{bmatrix}\text{V}\\ -\text{grv}\\ +\text{diff}\\ -\text{Reg}\end{bmatrix} \rightarrow \left\{\begin{matrix}\begin{bmatrix}-\text{Stem} = \text{PP}\\ +\text{Pst} = \text{PP}\\ -\text{Prs Um}\end{bmatrix}\\ [-\text{Pst} = \text{PP}] \;/\; \text{--}[+\text{nsl}]\end{matrix}\right\}$$

Now (1") specifies that for all strong stems in /ǐ/ or /ī/, the vowel of the past participle is not the same as the vowel of the stem, but it does not specify what vowel it is. Rule (4) does this:

$$(4)\qquad \begin{bmatrix} \text{V} \\ \text{-Reg} \end{bmatrix} \rightarrow \begin{bmatrix} \text{+grv} \\ \text{+flt} \end{bmatrix} \;/\; \begin{bmatrix} \overline{\quad} \\ \text{+PP}^{13} \\ \text{-Stem = PP} \end{bmatrix}$$

This rule will convert i to u, e to o, and a to ɔ for all verbs of Types 1, 2, 4, 5, 7, 8. As it stands, (4) will not produce the right forms in Types 7 and 8: how (4) must be restricted so that this incorrect result can be avoided will be seen below in the discussion of Types 7 and 8.

Observe that (4) is supported by the existence of deverbal nouns like Genǔss, Flǔss, Schūb, and Flūg, etc. (from genīessen, flīessen, schīeben, and flīegen, respectively. (Cf. the list of such nouns in 1.2) Whatever the rule for deriving these deverbal nouns is[14], it seems plausible to suppose that they are derived from stems to which (4) has already applied. (4) will then have to be changed so that it applies in the presence of the feature [+PP] or the feature [+Nominal], which causes nominalization:

$$(4")\qquad \begin{bmatrix} \text{V} \\ \text{-Reg} \end{bmatrix} \rightarrow \begin{bmatrix} \text{+grv} \\ \text{+flt} \end{bmatrix} \;/\; \begin{bmatrix} \overline{\quad} \\ \text{-Stem = PP} \\ \left\{ \begin{matrix} \text{+PP} \\ \text{+Nominal} \end{matrix} \right\} \end{bmatrix}$$

Flūg 'flight' and geflōgen 'flown' will then have the following derivations:

$$\text{Flūg: base form} \begin{bmatrix} \text{/flīg/} \\ \text{-Stem = PP} \\ \text{+Nominal} \end{bmatrix} \xrightarrow{4"} \begin{bmatrix} \text{flūg} \end{bmatrix}$$

$$\underline{\text{geflogen}}\text{:}\quad \text{base form}\quad \begin{bmatrix}/\text{fl}\bar{\text{i}}\text{g}/\\ -\text{Stem} = \text{PP}\\ +\text{PP}\end{bmatrix} \xrightarrow{4'} \text{fl}\bar{\text{u}}\text{g} \xrightarrow{\text{Spelling Rule}} \text{ge+fl}\bar{\text{u}}\text{g+en}$$

But the correct form for 'flown' is not *geflūgen but geflōgen. This suggests that (2), the rule which produces [begŏnen] from [begŭnen] be generalized so that it will also apply to geflūgen.

$$(2')\quad \begin{bmatrix}\text{u}\\ -\text{Reg}\end{bmatrix} \rightarrow \begin{Bmatrix}[-\text{next rule}]^{15} \;/\; \text{—}\; [+\text{nsl}]\; C_1\\ \\ [-\text{diff}] \;/\; \begin{bmatrix}\overline{\quad\quad}\\ +\text{PP}\\ -\text{Stem} = \text{PP}\end{bmatrix}\end{Bmatrix}$$

But both (4') and (2') must be generalized to apply in past tense contexts as well, so that flōg 'flew' will be produced, as well as geflōgen. The following revisions accomplish this.

(4") Backing

$$\begin{bmatrix}\text{V}\\ -\text{Reg}\end{bmatrix} \rightarrow \begin{bmatrix}+\text{grv}\\ +\text{flt}\end{bmatrix} \;/\; \begin{bmatrix}\overline{\quad\quad\quad\quad}\\ -\text{Stem} = \text{PP}\\ \begin{Bmatrix}+\text{PP}\\ +\text{Nominal}\\ \begin{bmatrix}+\text{Pst} = \text{PP}\\ +\text{Pst}\end{bmatrix}\end{Bmatrix}\end{bmatrix}$$

(2") Lowering

$$\begin{bmatrix}\text{u}\\ -\text{Reg}\end{bmatrix} \rightarrow \begin{Bmatrix}[-\text{next rule}] \;/\; \text{—}\; [+\text{nsl}]\; C_1\\ \\ [-\text{dff}] \;/\; \begin{bmatrix}\overline{\quad\quad\quad\quad}\\ -\text{Stem} = \text{PP}\\ \begin{Bmatrix}+\text{PP}\\ \begin{bmatrix}+\text{Pst}\\ +\text{Pst} = \text{PP}\end{bmatrix}\end{Bmatrix}\end{bmatrix}\end{Bmatrix}$$

1.22. Let us now return to our consideration of stems of Type 2. Type 2a verbs differ from those of Type 2b only in that the former have long vowels in all principal parts of the verb and in related deverbal nouns ending in one consonant, whereas the latter have short vowels in the past tense, past participle, and in all their deverbal nouns.

However, it will be noted that in all the cases where shortening takes place, the consonant that follows is voiceless[16]; and in all the cases[17] where no shortening takes place, the consonant in the stem is voiced. A rule which takes advantage of this regularity can be formulated, but I will postpone the precise statement of this rule until the discussion of Type 7 verbs (cf. § 1.52 below), because the rule must be made general enough to account for the shortening that takes place in Type 7b and Type 7d verbs as well.

1.3. Let us now examine the verb stems of Type 3. There are nine like *făllen* 'fall', which have an [ĭ] or [ī] in the past tense, and ten like *trāgen* 'carry', which have a long [ū] in the past tense.

Type 3a *blāsen* 'blow', *brāten* 'fry', *făngen* 'catch',
făllen 'fall', *rāten* 'guess', *hălten* 'hold'
hăngen 'hang', *lăssen* 'let', *schlāfen* 'sleep'

Type 3b *băcken* 'bake', *fāhren* 'drive', *frāgen* 'ask' (also regular)
grāben 'dig', *lāden* 'lead', *schăffen* 'create' *schlāgen* 'hit',
trāgen 'carry', *wăchsen* 'grow', *wăschen* 'wash'

It will be observed that the verbs of Type 3 are the only irregular verbs, with the exception of *haben* 'have' and *schallen* 'reverberate', which have a monophthongal [a] in the infinitive. This suggests that we postulate an underlying /a/ in the base form of Type 3 verbs and add the following rule:

(5) $$\begin{bmatrix} \text{V} \\ \text{+cmp} \\ \text{-Reg} \end{bmatrix} \rightarrow \begin{bmatrix} \text{+Stem = PP} \\ \text{-Pst = PP} \\ \text{+Prs Um.} \end{bmatrix} \quad / \; \text{—} \; [\text{+cns}]$$

Let us now consider whether it is possible to predict whether a stem in /a/ will have a past tense in [i] or [u]. In Type 3a, the vowel is followed by segments specified as

(A) z, s, t, l, n, f

while in Type 3b, the vowel is followed by

(B) b, d, g, k, s, r, f

The only overlap between lists (A) and (B) is f; and even here the overlap is not complete, for the f in (A) follows a long vowel (schlāfen), while the f in (B) follows a short vowel (schăffen). But neither (A) nor (B) is easily specifiable in terms of distinctive features, as far as I can see. The best generalization I have been able to extract is the following

(6) $$\begin{bmatrix} \text{V} \\ \text{+cmp} \\ \text{-Reg} \\ \text{+Pst} \end{bmatrix} \rightarrow \begin{matrix} \text{a.} \\ \\ \text{b.} \end{matrix} \left\{ \begin{matrix} \bar{\text{i}} \; / \; \text{—} \begin{bmatrix} \text{+cns} \\ \text{-grv} \\ \text{+dff} \\ \alpha\text{cnt} \\ \alpha\text{str} \end{bmatrix} \\ \\ \bar{\text{u}} \end{matrix} \right\}$$

The Greek letter 'α' is a variable over + and - and is used in rules expressing assimilation and dissimilation. Supposing, for instance, that obstruent clusters in some language were either all voiced or all unvoiced. This could be expressed by the 2 rules

(7) $$[\text{+obs}] \rightarrow \left\{ \begin{matrix} [\text{+voi}] \; / \; \text{—} \begin{bmatrix} \text{+obs} \\ \text{+voi} \end{bmatrix} \\ [\text{-voi}] \; / \; \text{—} \begin{bmatrix} \text{+obs} \\ \text{-voi} \end{bmatrix} \end{matrix} \right\}$$

or, equivalently, by the shorter (7')

(7') $[+\text{obs}] \rightarrow [\alpha\text{voi}] \;/\; \underline{\quad} \begin{bmatrix} +\text{obs} \\ \alpha\text{voi} \end{bmatrix}$

(7') states that an obstruent in a sequence of obstruents must assume the same value of the feature of voicing as the immediately succeeding obstruent has. If there were dissimilation, rule (7") would be used:[19]

(7") $[+\text{obs}] \rightarrow [-\alpha\text{voi}] \;/\; \underline{\quad} \begin{bmatrix} +\text{obs} \\ \alpha\text{voi} \end{bmatrix}$

Thus the topmost bundle of features in (6) specifies just those dental consonants whose features of continuancy and stridency agree in value, that is,

s, z, t, d, n, l

This means that *laden* will have to be marked so that it does not undergo rule (6a) and *schlafen* so that it does not undergo (6b).

At present, rule (6) is not stated generally enough, but I will postpone the full statement of it until the discussion of Type 7 stems below. (cf. § 1.512)

1.4. Let us now consider stems of Types 4, 5, and 6. The following 20 stems are of the "4 Vowel" type, i.e., they exhibit the alternations e-a-o-i.

Type 4 *běrgen* 'conceal', *běrsten* 'burst', *brěchen* 'break'
-*děrben* (cf. *verděrben* 'spoil'), *drěschen* 'thresh',
-*fēhlen* (cf. *befēhlen* 'command'), *gělten* 'have value',
hělfen 'help', *nēhmen* 'take', *schělten* 'scold'
-*schrěcken* (cf. *erschrěcken* 'be terrified'), *sprěchen* 'speak'

stěchen 'sting', *stěcken* 'stick' (also reg.),
stěhlen 'steal', *stěrben* 'die', *trěffen* 'meet'
wěrben 'court', *wěrden* 'become', *wěrfen* 'throw'[20]

There are 8 stems of Type 5a and 5 of Type 5b.

Type 5a *drěschen* 'thresh' (this stem can also be of Type 4),
fěchten 'fence', *flěchten* 'braid', (obs) *mělken* 'milk' (also reg.)
quěllen 'spring from', *schēren* 'shear', *schmělzen* 'melt',
schwěllen 'swell'

Type 5b *hēben* 'lift' (also conjugated with suppletive *hūb* in pasttense),
-*hēhlen* (cf. *verhēhlen* 'hide' (also regular)),
pflēgen 'do habitually',[20] *wēben* 'weave' (also regular),
-*wēgen* (cf. *bewēgen* 'move' (also regular))

There are 6 stems of Type 6a, 4 of Type 6b, and 3 of Type 6c:

Type 6a *gēben* 'give'[22], *lēsen* 'read',
-*nēsen* (cf. *genēsen* 'recover'[23]), -*schēhen* (cf. *geschēhen* 'happen'),
sēhen 'see', *trēten* 'step'

Type 6b *ěssen* 'eat'[24], *frěssen* 'devour greedily'
-*gěssen* (cf. *vergěssen* 'forget') *měssen* 'measure'

Type 6c *bǐtten* 'request', *līegen* 'lie', *sǐtzen* 'sit'[25]

All these have phonetic [ě̄] or [ē] in the infinitive except Type 6c, which has a phonetic [ǐ] or [ī]. But it will lead to the simplest description if Type 6c stems are considered to have /ě/ or /ē/ in their underlying representations. A rule raising this /e/ to [i] in the infinitive will then be required. This rule will also be used in the derivation of *bringen* 'bring', which I will analyze as a Type 8 stem. (Cf. § 1.61 below.)

One redundancy which now becomes immediately apparent is the following: except for verbs of Type 8 or 5b, all verbs with /e/ in their underlying representation must be marked [+Prs Um]. Inspection reveals that Type 8 stems are all of the form $/C_1^2\ \check{e}\ [+\text{nsl}]\ C/$, so a rule predicting [+Prs Um] can be formulated:

$$(8)\qquad \begin{bmatrix} \text{V} \\ \text{-grv} \\ \text{-dff} \\ \text{-cmp} \\ \text{-Reg} \end{bmatrix} \rightarrow \begin{Bmatrix} [\text{-next rule}] \ / \ \underline{\qquad}\ [\text{+nsl}] \\ [\text{+Prs Um}] \end{Bmatrix}$$

Unfortunately, as far as I can ascertain, the 5 stems of Type 5b share no phonological features which could be used to except them automatically from rule (8), so they will have to be marked in the lexicon in such a way as to prevent rule (8) from applying.

1.41. Let us now consider the effects of assigning the feature [+Prs Um] to a stem. Only stems of Types 3 - 6 and 3 stems of Type 10 will be marked [+Prs Um] - all other stems will have the feature [-Prs Um].

Zwicky has shown[26] that whether or not a particular stem umlauts when followed by a particular suffix is a function of two features: a feature characterizing the stem as susceptible or non-susceptible to umlaut, and a feature of the suffix which characterizes it as umlaut-causing, neutral, or umlaut-blocking. Subject to complex conditions of combination, the compound is marked with either [+Umlaut] or [-Umlaut]. If the former is the case, the compound undergoes a rule which is roughly of the form of (9):

$$(9) \quad \begin{bmatrix} V \\ +\text{stress} \end{bmatrix} \rightarrow [-\text{grv}] \; / \; \begin{bmatrix} \rule{2em}{0.4pt} \\ +\text{Umlaut} \end{bmatrix} C_o \left(\begin{bmatrix} V \\ -\text{stress} \end{bmatrix} C_o \right)_o$$

This rule applies vacuously to front vowels, and changes [u] to [ü], [o] to [ö], and [a] to [æ] among the back vowels.

In order to handle the umlauting in the present of Type 3 verbs, it is only necessary to expand the domain of applicability of (9) as follows:

$$(9') \quad \begin{bmatrix} V \\ +\text{stress} \end{bmatrix} \rightarrow [-\text{grv}] \; / \; \left\{ \begin{matrix} +\text{Umlaut} \\ \begin{bmatrix} +\text{Prs Um} \\ -\text{1st person} \\ +\text{Singular} \\ -\text{Pst} \end{bmatrix} \end{matrix} \right\} C_o \left(\begin{bmatrix} V \\ -\text{stress} \end{bmatrix} C_o \right)_o$$

Rule (9') will change /fang+t/ '(he) catches' to [fængt],[27] but it will leave /lez+t/ '(he) reads' unchanged.

Zwicky has also noted that although front vowels are usually unaffected by unlaut, there is one context where an *e* to *i* change is caused: in neuter nouns of the form /ge+$[\overline{}_{\text{stem}}]$+(e)/. That is, parallel to

tosen 'roil' - *Getöse* 'dim, cacophony'

schwatzen 'chatter' - *Geschwätz* 'chatter, gossip'

we also find:

Feld 'field' - *Gefilde* 'landscape'

Wetter 'weather' - *Gewitter* 'storm'

Berg 'mountain' - *Gebirge* 'range of mountains'

Schwester 'sister' - *Geschwister* 'siblings'

Feder 'feather' - *Gefieder* 'plumage'

Recht 'justice' - *Gericht* 'court'

Stern 'star' - *Gestirn* - 'constellation'

Since the rule e → i shares some environments with (9") it should be considered as a part of the umlaut rule. Now it becomes clear that the e - i alternation in stems of Types 4 - 6 is really just a type of umlaut, exactly parallel to the a - ä alternation in verbs of Type 3, and that both of these alternations can be handled by the umlaut rule, which is needed in the grammar for independent reasons.

Precise statement of the rule is difficult - I have not been able to find a more compact version than (9")

(9") Umlaut[28, 29]

$$\begin{bmatrix} V \\ \left\langle \begin{matrix} -\text{cmp} \\ \text{[illegible]} \end{matrix} \right\rangle_a \end{bmatrix} \rightarrow \begin{bmatrix} -\text{grv} \\ {}_b\langle +\text{dff} \rangle_b \end{bmatrix} / \left[{}_{\text{Stem}}\, x \begin{bmatrix} \overline{} \\ +\text{stress} \end{bmatrix} \left(C_o \begin{bmatrix} V \\ -\text{stress} \end{bmatrix} C_o \right)_o \right] / \left\{ \begin{matrix} \begin{bmatrix} \overline{} \\ +\text{Umlaut} \end{bmatrix} \\ \left\langle \left(\begin{matrix} \text{ge}+\underline{}+(\text{e}) \\ \begin{bmatrix} \overline{} \\ +\text{Prs Um} \\ +\text{Pres} \\ -\text{1st} \\ +\text{Sing} \end{bmatrix} \end{matrix} \right) \right\rangle_c \end{matrix} \right\}$$

Condition: if a and c, then b

1.42. Now let us return to the question of what other morphological features of the stems of Types 4 - 6 are predictable. We have already noted that, with the exception of the 5 verbs of Type 5b, all stems containing the vowel /e/ and not followed by [+nsl] are to be redundantly specified as [+Prs Um] (cf. (8)). Can the other main classificatory features, [± Stem = PP] and [± Pst = PP], be similarly predicted?

At present, I can see no way of doing so with the following exception: the vowel /e/ of Type 4 stems occurs before the following consonants and consonant clusters:

After /ě/				After /ē/
)	lf	f	m^{30}	
r				
l	lt	ž		
st				
ʒ		x	k	

With the exception of schmelzen 'melt' of Type 5a, there are no Type 5 or Type 6 verbs which end in $\check{e}\begin{Bmatrix} r \\ l \end{Bmatrix} C_1$, or $\check{e}\begin{bmatrix} +obs \\ -voi \\ +grv \end{bmatrix}$. So the following rule can be set up:

$$(8') \quad \begin{bmatrix} e \\ -Reg \end{bmatrix} \rightarrow \begin{bmatrix} -Stem = PP \\ -Pst = PP \end{bmatrix} \Big/ \left\{ \begin{matrix} \underline{\quad\quad} \begin{bmatrix} +cns \\ +voc \end{bmatrix} C_1 \\ \underline{\quad\quad} \begin{bmatrix} +obs \\ -voi \\ +grv \end{bmatrix} \end{matrix} \right\}$$

As far as I can see, there is no way to predict the morphological characteristics of Type 5 or 6 on phonological grounds, although the following regularity obtains. Type 5 stems are all [-Stem = PP, + Pst = PP], whereas stems of Type 6 are all [+Stem = PP, -Pst = PP]. In other words, there is dissimilation of these two abstract features in these two types, so it will be sufficient to mark one, say [$\pm$ Stem = PP] in the lexicon and predict the value of the other feature on the basis of this marking by the following rule:

$$(8'') \quad \begin{bmatrix} e \\ -Reg \end{bmatrix} \rightarrow [-\alpha\, Pst = PP] \Big/ \begin{bmatrix} \underline{\quad\quad} \\ \alpha\, Stem = PP \end{bmatrix}$$

However, we can see that (8") must be restricted so that it does not apply to stems of Type 4, for these are [-Stem = PP, -Pst = PP]. In (8"'), this restriction has been provided for, and (8) and (8') have also been incorporated.

$$(8''')\quad \begin{bmatrix}+\text{e}\\ -\text{Reg}\end{bmatrix} \rightarrow \left\{\begin{array}{l} [-\text{next rule}] \;/\; \_\_\_\_ \;[+\text{nsl}] \\[6pt] [+\text{Prs Um}] \\[6pt] \begin{bmatrix}-\text{Stem} = \text{PP}\\ -\text{Pst} = \text{PP}\\ \\ -\text{next rule}\end{bmatrix} \Big/ \left\{\begin{array}{l} \_\_\_\_ \begin{bmatrix}+\text{cns}\\ +\text{voc}\end{bmatrix} C_1 \\[6pt] \_\_\_\_ \begin{bmatrix}+\text{obs}\\ -\text{voi}\\ +\text{grv}\end{bmatrix} \end{array}\right\} \\[6pt] [-\alpha\text{Pst} = \text{PP}] \;/\; \begin{bmatrix}\overline{\alpha\text{Stem}} = \text{PP}\end{bmatrix} \end{array}\right\}$$

1.43. There is one other feature of Type 4 verbs which requires comment. In forming the past subjunctive, most strong verbs simply umlaut the past tense vowel and suffix the subjunctive marker -e-.

Past Indicative

	Singular	Plural
1st	flōg 'flew'	flōgen
2nd	flōgst	flōgt
3rd	flōg	flōgen

Past Subjunctive

1st	flȫge (from /flīg+ě+ě/)	flȫgen
2nd	flȫgest (from /flīg+ě+ěst/)	flȫgt
3rd	flȫge etc.	flȫgen

This means that the rules forming the past tense of flīegen 'fly' ((4") Backing and (2") Lowering, cf. § 1.21 above) must precede the umlaut rule (9"), and that another branch must be added to (9") to cause umlauting in the context $\begin{bmatrix}+\text{Pst}\\ -\text{Indic}\\ -\text{Reg}\end{bmatrix}$, where

[± Indic] distinguishes between indicative and subjunctive mood. This revision in (9") will be postponed until the Appendix.

Some verbs of Type 4 regularly exhibit an a in the past subjunctive (sprěchen - sprǟche 'speak', nēhmen - nǟhme 'take', etc.), but the following 12 stems exhibit ö or ü:

ö	ü
běrsten - bö̌rste 'burst'	běrgen - bǚrge 'hide'
-fēhlen - -fȫhle (cf. befehlen 'command')	-děrben - -dǚrbe (cf. verděrben 'spoil)
gělten - gö̌lte 'have value'	hělfen - hǚlfe 'help'
schělten - schö̌lte 'scold'	stěrben - stǚrbe 'die'
stēhlen - stȫhle 'steal'	wěrben - wǚrbe 'court
	wērden - wǚrde 'become'
	wěrfen - wǚrfe 'throw'

With two exceptions (bö̌rste and hǚlfe), ö̌ precedes l and ǚ precedes r. This suggests the rule

(10) Special Past Subjunctive

$$V \rightarrow \begin{bmatrix} -\text{cmp} \\ \alpha\text{dff} \end{bmatrix} / \begin{bmatrix} \rule{2em}{0.4pt} \\ -\text{Reg} \\ -\text{Pst} = \text{PP} \\ -\text{Stem} = \text{PP} \\ +\text{Prs Um} \\ -\text{Indic} \\ +\text{Pst} \end{bmatrix} \begin{bmatrix} +\text{voc} \\ \alpha\text{cnt} \end{bmatrix}$$

Hǚlfe and bö̌rste will, of course, be marked specially in the lexicon.

1.5. Let us now proceed to an examination of stems of Type 7. There are 18 of Type 7a, 22 of Type 7b, 3 of Type 7c, and 1 of Type 7d:

Type 7a: bleiben 'stay', -deihen (cf. gedeihen 'thrive')
heissen 'be called', leihen 'lend', meiden 'avoid',

preisen 'praise', *reiben* 'rub', *scheiden* 'separate'
scheinen 'seem', *schreien* 'cry', *schreiben* 'write'
schweigen 'be silent', *speien* 'spew', *steigen* 'climb'
treiben 'drive', *weichen* (cf. *ausweichen* 'give way to')
weisen 'indicate', *zeihen* 'accuse of'

Type 7b *beissen* 'bite', -*bleichen* (cf. *erbleichen* 'grow pale' (also regular)),
-*fleissen* (cf. *befleissen* 'devote oneself to') *gleichen* 'equal'
gleissen 'gleam, dazzle' (also regular), *gleiten* 'glide',
greifen 'grasp', *kneifen* 'pinch', *kreischen* 'scream',
leiden 'suffer', *pfeifen* 'whistle', *reissen* 'tear',
reiten 'ride', *scheissen* 'shit', *schleifen* 'smooth e'
schleissen 'consume', *schmeissen* 'throw', *schneiden* 'cut'
schreiten 'stride', *spleissen* 'splice' (also regular),
streichen 'paint', *streiten* 'quarrel'

Type 7c *saugen* 'suck', *schnauben* 'snort', *schrauben* 'screw'

Type 7d *saufen* 'swill'

First of all, note that these are the only verbs having a diphthong in their infinitive, except for the irregular *laufen* 'run' and *hauen* 'hew', and the suppletive *sein* 'be'. All these verbs are [-Stem = PP, +Pst = PP], and all are [-Prs Um] with the exception of the irregular *saufen* 'swill'. This suggests the rule

$$(11)\quad \begin{bmatrix} \text{V} \\ \text{-Reg} \end{bmatrix} \rightarrow \begin{bmatrix} \text{-Stem = PP} \\ \text{+Pst = PP} \\ \text{-Prs Um} \end{bmatrix} \;/\; \_\_\_ \begin{bmatrix} \text{-cns} \\ \text{-voc} \end{bmatrix}$$

Types 7b and 7d differ from Types 7a and 7c respectively in that the former exhibit short vowels in the past tense and past participle[31], whereas the latter have long vowels there. It will be remembered from the discussion of Type 2b (cf. § 1.22 above) that stems of this type ending in a voiceless consonant also shorten their stem vowel in the past tense and past participle. I will show that one rule can be written for both types of shortening, but before I do so, I must digress for a moment to explain the rules that produce past tense forms.

1.511. All verbs of Type 7 have either an /ay/ or an /aw/ diphthong in their underlying form. Those having the front semivowel /y/ exhibit the front vowels [ī] or [ĭ] in the past tense and past participle, while those having the back semivowel /w/ exhibit the back vowels [ō] or [ŏ] in these forms. The transformational rule (12) expresses this regularity.

(12) Past Tense II

$$\underset{1}{\begin{bmatrix} \text{V} \\ \text{-Reg} \\ \text{+Pst} \\ \text{+PP} \end{bmatrix}} - \underset{2}{\begin{bmatrix} \text{-cns} \\ \text{-voc} \end{bmatrix}} \Rightarrow \emptyset - \begin{bmatrix} 2 \\ \text{+voc} \\ \text{+long} \end{bmatrix}$$

(12) deletes the /a/ of all diphthongs and converts their semivowel into the corresponding long diffuse vowel. This long vowel will be shortened by the shortening rule in certain cases, as we will see below (cf. §1.52).

1.512 Now let us consider the vowels exhibited by other types of verbs in the past tense. In Types 2 (bīegen - bōg) and 5 (fĕchten - fŏcht), the vowel is [ō] or [ŏ], and the rule for producing this vowel has already been given (cf. (4") Backing and (2') Lowering in § 1.21 above).

In Types 1 (fĭnden - fănd), 4 (hĕlfen - hălf), 6 (lēsen - lās) and 8 (brĕnnen - brănnte) we find an [ā] or an [ă]. It will be noted that the underlying vowel in all these stems is [-cmp].

In Type 3, where the stem vowel is /a/, which is $\begin{bmatrix}+\text{cmp}\\-\text{dff}\end{bmatrix}$, we find the past tense vowels [$\bar{\text{i}}$] or [$\bar{\text{u}}$], both of which are $\begin{bmatrix}+\text{dff}\\-\text{cmp}\end{bmatrix}$.

So it seems that there is one process at work in both the cases of Types 1, 4, 6, and 8 and Type 3: if the stem vowel is high ($\begin{bmatrix}+\text{dff}\\-\text{cmp}\end{bmatrix}$) or mid ($\begin{bmatrix}-\text{dff}\\-\text{cmp}\end{bmatrix}$), it is made low ($\begin{bmatrix}+\text{cmp}\\-\text{dff}\end{bmatrix}$); if the stem vowel is low ($\begin{bmatrix}+\text{cmp}\\-\text{dff}\end{bmatrix}$), it is made high ($\begin{bmatrix}+\text{dff}\\-\text{cmp}\end{bmatrix}$). In other words, there seems to be a switching of polarity[32] of the feature [cmp]. Vowels which are [+cmp] become [-cmp] and vice versa. This can be formulated economically by a rule such as (13)[33]

$$(13)\quad \begin{bmatrix}\text{V}\\-\text{Reg}\\\alpha\,\text{cmp}\end{bmatrix} \rightarrow [-\alpha\,\text{cmp}]$$

But (13) is too strong in that it applies to all vowels, and too weak in that it changes the compactness of the vowel /a/, but it does not specify whether it becomes [$\bar{\text{i}}$] or [$\bar{\text{u}}$].

In order to restrict the domain of application of (13), it is necessary to consider only the following fact: Stems of Types 1, 3, 4, and 6, and only those stems, are marked by the feature [-Pst = PP]. Rule (13) must also apply to Type 8 stems, which are marked [+Pst =PP], so a special provision will be made for them below (cf. § 1.6).

Let us now return to rule (6) (cf. § 1.3), which I will repeat for convenience

$$\begin{bmatrix}\text{V}\\-\text{Reg}\\+\text{cmp}\\+\text{Pst}\end{bmatrix} \rightarrow \left\{\begin{matrix}\bar{\text{i}} & / & \underline{\qquad} & \begin{bmatrix}+\text{cns}\\-\text{grv}\\+\text{dff}\\\alpha\,\text{cnt}\\\alpha\,\text{str}\end{bmatrix}\\ \bar{\text{u}} & & & \end{matrix}\right\}$$

be noted that the underlying vowel in all these stems is [-cmp].

In Type 3, where the stem vowel is /a/, which is $\begin{bmatrix}+\text{cmp}\\-\text{dff}\end{bmatrix}$, we find the past tense vowels [$\bar{\text{i}}$] or [$\bar{\text{u}}$], both of which are $\begin{bmatrix}+\text{dff}\\-\text{cmp}\end{bmatrix}$.

So it seems that there is one process at work in both the cases of Types 1, 4, 6, and 8 and Type 3: if the stem vowel is high ($\begin{bmatrix}+\text{dff}\\-\text{cmp}\end{bmatrix}$) or mid ($\begin{bmatrix}-\text{dff}\\-\text{cmp}\end{bmatrix}$), it is made low ($\begin{bmatrix}+\text{cmp}\\-\text{dff}\end{bmatrix}$); if the stem vowel is low ($\begin{bmatrix}+\text{cmp}\\-\text{dff}\end{bmatrix}$), it is made high ($\begin{bmatrix}+\text{dff}\\-\text{cmp}\end{bmatrix}$). In other words, there seems to be a switching of polarity[32] of the feature [cmp]. Vowels which are [+cmp] become [-cmp] and *vice versa*. This can be formulated economically by a rule such as (13)[33]

$$(13)\quad \begin{bmatrix}\text{V}\\-\text{Reg}\\\alpha\,\text{cmp}\end{bmatrix} \rightarrow [-\alpha\,\text{cmp}]$$

But (13) is too strong in that it applies to all vowels, and too weak in that it changes the compactness of the vowel /a/, but it does not specify whether it becomes [$\bar{\text{i}}$] or [$\bar{\text{u}}$].

In order to restrict the domain of application of (13), it is necessary to consider only the following fact: Stems of Types 1, 3, 4, and 6, and only those stems, are marked by the feature [-Pst = PP]. Rule (13) must also apply to Type 8 stems, which are marked [+Pst =PP], so a special provision will be made for them below (cf. § 1.6).

Let us now return to rule (6) (cf. § 1.3), which I will repeat for convenience

$$\begin{bmatrix}\text{V}\\-\text{Reg}\\+\text{cmp}\\+\text{Pst}\end{bmatrix} \rightarrow \left\{\begin{array}{l}\bar{\text{i}}\quad / \quad \text{———}\quad \begin{bmatrix}+\text{cns}\\-\text{grv}\\+\text{dff}\\\alpha\,\text{cnt}\\\alpha\,\text{str}\end{bmatrix}\\ \\ \bar{\text{u}}\end{array}\right\}$$

Given that some version of rule (12) must be in the grammar, a simplification of (6) suggests itself:

(6') æ - ɔ

$$\begin{bmatrix} \text{V} \\ -\text{Reg} \\ +\text{cmp} \\ +\text{Pst} \end{bmatrix} \rightarrow \left\{ \begin{matrix} [+\text{flt}] \;/\; \_\_\_ \;[+\text{cns}] \\ \\ \begin{bmatrix} -\text{flt} \\ -\text{grv} \end{bmatrix} \;/\; \_\_\_ \begin{bmatrix} +\text{cns} \\ -\text{grv} \\ +\text{dff} \\ \alpha\text{cnt} \\ \alpha\text{str} \end{bmatrix} \end{matrix} \right\}$$

This rule converts /a/ to [ɔ] except before glides, and then it converts [ɔ] to [æ] before s, z, t, d, n, l. Thus,

$$/\text{tr}\bar{\text{a}}\text{g}/ \xrightarrow{6'} [\text{tr}\bar{\text{ɔ}}\text{g}]$$
$$/\text{f}\breve{\text{a}}\text{l}/ \xrightarrow{6'} [\text{f}\breve{\text{æ}}\text{l}]$$

If rule (13) now operates on the output of rule (6), we derive

$$[\text{f}\breve{\text{æ}}\text{l}] \xrightarrow{13} [\text{f}\breve{\text{e}}\text{l}]$$
$$[\text{tr}\bar{\text{ɔ}}\text{g}] \xrightarrow{13} [\text{tr}\bar{\text{o}}\text{g}]$$

We have not yet derived the correct [fīl] and [trūg], but we are closer than before.

Let us now consider how (13) operates on [-cmp] stems. Operating on /hĕlf/, where the /ĕ/ is $\begin{bmatrix} -\text{cmp} \\ -\text{dff} \end{bmatrix}$, (13) produces [hæ̆lf].

But when (13) operates on the /ĭ/ of /fĭnd/, which is $\begin{bmatrix} +\text{dff} \\ -\text{cmp} \end{bmatrix}$, it produces the impossible feature bundle $\begin{bmatrix} +\text{dff} \\ +\text{cmp} \end{bmatrix}$.

Suppose we modify (13) to make it switch both the value of the feature of diffuseness and the value of the feature of compactness:

$$(13') \quad \begin{bmatrix} \text{V} \\ -\text{Reg} \\ -\text{Pst} = \text{PP} \\ \alpha\text{cmp} \\ \beta\text{dff} \end{bmatrix} \rightarrow \begin{bmatrix} -\alpha\ \text{cmp} \\ -\beta\ \text{dff} \end{bmatrix}$$

This will produce the following results:

/făl/ $\xrightarrow{6'}$ [fæ̆l] $\xrightarrow{13'}$ [fĭl]

/trāg/ $\xrightarrow{6'}$ [trɔ̄g] $\xrightarrow{13'}$ [trūg]

/fĭnd/ $\xrightarrow{6'}$ (does not apply) $\xrightarrow{13'}$ [fæ̆nd]

/hĕlf/ $\xrightarrow{6'}$ (does not apply) $\xrightarrow{13'}$ *h$\begin{bmatrix} +\text{dff} \\ +\text{cmp} \end{bmatrix}$ lf

We notice that the results are incorrect in only 3 particulars: we have derived [fĭl], when the correct form has a long [ī]; we have derived [fæ̆nd], when the correct form is [fănd]; and we have derived an impossible segment which is both [+cmp] and [+dff].

The last two difficulties can be taken care of by the following rule:

(14) Compact Vowel Adjustment

$$\begin{bmatrix} \text{V} \\ +\text{cmp} \end{bmatrix} \rightarrow \begin{Bmatrix} [-\text{next rule}] \ / \ \underline{\quad} \ [-\text{cns}] \\ \\ \begin{bmatrix} -\text{dff} \\ +\text{grv} \\ -\text{flt} \end{bmatrix} \end{Bmatrix}$$

(14) merely states that the only compact vowel in German is [a], except for the [ɔ] in the diphthong [ɔy] as in heute [hɔytə] 'today'. It is clear that (14) must be ordered before (9"), which umlauts [a] to [æ].

1.513. The one remaining difficulty, i.e., that the vowel of [fĭl] is short instead of long, can be obviated by the following considerations:

The vowel of the past tense always agrees with the underlying vowel in length except in the following cases: Type 2b stems which have a short [ŏ] in the past tense (cf. § 1.52 below for discussion of the rule which effects this shortening); Type 3 stems (*făllen* - *fīel* 'fall', *băcken* - *būk* 'bake'); Type 4 stems (*sprĕchen* - *sprāch* 'speak', *trĕffen* - *trāf* 'meet'); and Type 6b stems (*ĕssen* - *āss* 'eat', *mĕssen* - *māss* 'measure'). Stems of Types 3, 4, and 6 always have a long vowel unless this vowel precedes certain consonant clusters like *-ng*, *-rb*, *-rf*, before which long vowels and diphthongs are excluded. So we will generate a long vowel in these three types in the past tense and shorten it by a later rule if it precedes a cluster before which long vowels are inadmissible.

To present a detailed analysis of the relationship between vowel length and final clusters would go beyond the scope of the present paper, so I will make only a few observations. The most important regularity in this area is that in general long vowels and diphthongs do not occur $/\overset{\text{in}}{\underline{\quad\quad}}\begin{bmatrix}-\text{obs}\\+\text{cns}\end{bmatrix}C_1$ (i.e., before *mC*, *nC*, *rC*, *lC*). I know of no counterexamples for the cases of *mC* and *lC*, and of only three before *nC*: *Mōnd* 'moon', *Freund* 'friend', and *Feind* 'enemy'.

Before *rC*, the situation is more complex. In morphemes whose vowel is followed by /rz/, /rt/, /rd/ or /rš/, long vowels as well as short can occur, as Paul Kiparsky has called to my attention. With long vowels, I have found the following words:

Bārs (or *Bārsch*) 'perch', *Ārt* 'species', *Ārt* 'arable land', *zārt* 'tender', *Stārt* 'start', *Wērt* 'worth', *Quārz* 'quartz', *Ārzt* 'doctor', *Ārsch* 'ass', *wērden* 'become', *Pfērd* 'horse', *Ērde* 'earth', *Hārz* 'resin', *Hērd* 'hearth', *Hērde* 'herd', *Schwārte* 'thick, hard skin', *Schwērt* 'sword', etc.

These contrast with words like the following:

Bărte 'broad-axe', *apărt* 'distinctive', *hărt* 'hard', *wărten* 'wait', *Părt* 'share', *Bărde* 'bard', *schwărz* 'black', *hărsch* 'harsh', *Bĕrtha* (girl's name), *Wărze* 'wart', etc.

I have not been able to find any long vowels other than [ā] or [ē] in this environment, but my search has not been exhaustive. To the best of my knowledge, *Vr* occurs only before the consonants I have given: words like **tērfen*, **fārche* and **stārm* are impossible. Nor can diphthongs occur before *rC*: **heirt*, **waurden* and **leurse* must be excluded.

I have no explanation for why long /ā/ and /ē/ should be able to occur in these environments, but since it is clear that the generalization that long vowels and diphthongs do not occur in $\_\_\_ \begin{bmatrix} -\text{obs} \\ +\text{cns} \end{bmatrix} C_1$ holds for a vast majority of German morphemes, I propose the addition of a rule like the following to the grammar:

(15) *Cluster Shortening*

$$V \rightarrow \left\{ \begin{array}{l} [-\text{next rule}] \;/\; \begin{bmatrix} \_\_\_ \\ -\text{dff} \\ -\text{flt} \end{bmatrix} \begin{bmatrix} +\text{voc} \\ +\text{cnt} \end{bmatrix} \begin{bmatrix} +\text{obs} \\ -\text{grv} \end{bmatrix} \\ \\ [-\text{long}] \;/\; \_\_\_ \begin{bmatrix} -\text{obs} \\ +\text{cns} \end{bmatrix} C_1 \end{array} \right\}$$

This rule shortens all vowels except /ā/ and /ē/ when followed by /r/ and a [-grv] obstruent. *Mond*, *Freund*, and *Feind* will have to be marked in the lexicon in such a way that they do not undergo (15). I wish to emphasize that (15) is only a tentative formulation of only one regularity which obtains between vowel length and consonant clusters. In a more detailed treatment of German morpheme structure, rule (15) would be replaced by a rule which could account for a broader range of facts, such as, for example, the fact that although long vowels and diphthongs occur freely before /st/ (Bi͞est 'beast', Geist 'spirit'), they do not occur before /sp/ (*bi͞esp, *geisp - the one exception to this generalization is räuspern 'clear one's throat').

1.514. It turns out that only stems of Types 3, 4, and 6 share the features [-Pst = PP, +Prs Um], so the phenomenon of lengthening in just these types can be accounted for by reformulating (13') as follows:

(13") Past Tense I

$$\begin{bmatrix} V \\ -\text{Reg} \\ +\text{Pst} \\ -\ \text{Pst} = \text{PP} \\ \alpha\text{cmp} \\ \beta\text{dff} \end{bmatrix} \rightarrow \left\{ \begin{matrix} \begin{bmatrix} -\alpha\text{cmp} \\ -\beta\text{dff} \end{bmatrix} \\ \\ [+\text{long}] \ / \ \begin{bmatrix} \overline{} \\ +\text{Prs Um} \end{bmatrix} \end{matrix} \right\}$$

It is immediately apparent that rule (12), which deletes the first vowel of the diphthong in Type 7 stems, must follow (13"), for otherwise we would derive the incorrect *[blāb] as the past tense of bleiben 'stay' as follows

$$/\text{blayb}/ \xrightarrow{6'} \text{(does not apply)} \xrightarrow{12} [\text{bl}\bar{\text{i}}\text{b}] \xrightarrow{13''} [\text{bl}\bar{\text{æ}}\text{b}] \xrightarrow{14} [\text{bl}\bar{\text{a}}\text{b}]$$

The correct ordering (13") - (12) produces the following derivation:

$$/\text{blayb}/ \xrightarrow{6'} \text{(does not apply)} \xrightarrow{13''} [\text{bl}\bar{\text{i}}\text{yb}] \xrightarrow{12} [\text{bl}\bar{\text{i}}\text{b}]$$

Furthermore, (13") must precede (15), Cluster Shortening Thus fĭng 'he caught', wărf 'he threw', and vergāss 'he forgot' will be derived as follows:

/fǎng/ $\xrightarrow{6'}$ fæ̌ng $\xrightarrow{13''}$ fīng $\xrightarrow{15}$ [fǐng] (rules which I have not discussed will assimilate the underlying /n/ to [ŋ] and then delete the final /g/ - cf. fn. 8).

/věrf/ $\xrightarrow{6'}$ (does not apply) $\xrightarrow{13''}$ v $\begin{bmatrix}\text{V}\\ +\text{cmp}\\ +\text{dff}\\ +\text{long}\end{bmatrix}$ rf $\xrightarrow{14}$ vārf $\xrightarrow{15}$ [vǎrf]

/fěr+gěs/ $\xrightarrow{6'}$ (does not apply) $\xrightarrow{13''}$ fěrg $\begin{bmatrix}\text{V}\\ +\text{cmp}\\ +\text{dff}\\ +\text{long}\end{bmatrix}$ s $\xrightarrow{14}$

fěrgās $\xrightarrow{15}$ (does not apply) → [fěrgās]

Note that *hielt* 'he held' must be marked as being an exception to (15); in all other respects, its derivation exactly parallels that of *fing*.

1.52. Let us now return to our consideration of stems of Type 2b, 7b, and 7d, which exhibit a short vowel in the past tense and past participle. It was noted above (cf. §1.22) that stems of Type 2b were to be analyzed as ending in a voiceless consonant in their underlying form, while Type 2a stems ended in a voiced consonant. With 4 exceptions, the same regularity is observable among stems of Types 7a and 7c versus 7b and 7d. The only irregular stems are *schneiden* - *schnǐtt* 'cut' *leiden* - *lǐtt* 'suffer', *heissen* - *hīess* 'be called', and -*weichen* - *wīch* (which is pronounced by some speakers anyway, as [vīç]) (cf. *ausweichen* 'give way to') where we would expect *[šnīd], *[līd], *[hǐs], and *[vǐç] respectively.

It will be remembered that among the Type 2 stems there was only one, *sīeden* - *sǒtt* 'boil', which had to be treated as an exception. In footnote 16 I suggested a possible explanation for the irregularity of sīeden, schneiden and leiden: since all these verbs exhibit a d ~ t alternation which has to be accounted for anyway, the simplest solution is to set up the base forms /zīt/, /šnayt/ and /layt/ and mark only these forms as undergoing the following rule, which changes the /t/ to [d] in the infinitive and present tense:

Dental Mutation

$$\begin{bmatrix}+\text{obs}\\-\text{cnt}\\-\text{grv}\\+\text{dff}\end{bmatrix} \rightarrow [+\text{voi}] \;/\; \begin{bmatrix}\underline{\qquad}\\+\text{DM}\\\begin{Bmatrix}+\text{Prs}\\+\text{inf}\end{Bmatrix}\end{bmatrix}^{34}$$

These three stems now conform to the general rule of vowel shortening in the past tense, past participle, and in deverbal nouns. The only types where shortening occurs are Types 2 and 7, and these two can be specified by the features [-Stem = PP, +Pst = PP].

So the rule for shortening can be formulated as follows:

(16) Shortening

$$\begin{bmatrix}\text{V}\\-\text{Reg}\\-\text{Stem} = \text{PP}\\+\text{Pst} = \text{PP}\\\begin{Bmatrix}+\text{PP}\\+\text{Pst}\\+\text{Nominal}\end{Bmatrix}\end{bmatrix} \rightarrow [-\text{long}] \;/\; \underline{\qquad}\; [-\text{voi}]$$

The verbs heissen and (for some speakers) weichen will have to be marked in the lexicon as not undergoing (16). Type 5b stems, which are also [-Stem = PP, +Pst = PP], will not undergo (16) because their final consonant is voiced. The same holds true of the 3 Type 10 stems wägen, schwären, and gären.

1.6 There are 7 verbs of Type 8:

brĕnnen 'burn', dĕnken[35] 'think', kĕnnen 'know', nĕnnen 'name', rĕnnen 'run', sĕnden 'send', wĕnden 'turn'.

Two features about the principal parts of these verbs distinguish them from all other types discussed above. Firstly, they must have the feature [-Stem = PP] and yet the vowel of the past participle is not [ŭ], [ô] or [ŏ], as it is in the case of all other stems with this marking, but rather [ă]; and secondly, they exhibit the weak affixes -et and ge- ...-et in the past tense and past participle forms. But both of these idiosyncrăsies can be predicted from the phonological shape of these stems: in these stems and these only (but cf. fn. 30 above), the sequence $/C_1\breve{e}[+\text{nsl}]C/$ occurs.

In order to handle the second problem, I will set up the feature [±et] to subclassify strong verbs as to what inflections they exhibit. With the two exceptions of the verb wíssen 'know', and the verb dü̆nken 'seem', the feature [+et] is entirely predictable: all regular verbs are [+et], all irregular verbs in /e[+nsl]/ are [+et], and all modals are [+et]. The two Inflectional rules which refer to this feature are the following:

(17) et Suffixation

$$\emptyset \rightarrow \text{et} \,/\, \begin{bmatrix}+\text{et}\\+\text{Pst}\\+\text{PP}\end{bmatrix} \underset{\text{Stem}}{+} \_\_\_$$

(18) Past Participle Inflection

$$\emptyset \rightarrow \left\{\begin{array}{l} \text{g}\breve{\text{e}} \,/\, \_\_\_ + [_{\text{Stem}} \\ \\ \breve{\text{e}}\text{n} \,/\, [-\text{et}]] \underset{\text{Stem}}{+} \_\_\_ \end{array}\right\} \,/\, \begin{bmatrix}\_\_\_\\+\text{PP}\end{bmatrix}$$

The vowel [ă] in the past participle can be derived by expanding the context of (13") Past Tense I (cf. § 1.512) as follows:

$$\begin{bmatrix} \text{V} \\ -\text{Reg} \\ \alpha\text{cmp} \\ \beta\text{dff} \end{bmatrix} \rightarrow \left\{ \begin{array}{ll} \begin{bmatrix}-\alpha\text{cmp}\\-\beta\text{dff}\end{bmatrix} \; / & \left\{\begin{array}{l} \begin{bmatrix} \overline{\hspace{4em}} \\ +\text{Pst} \\ -\text{Pst} = \text{PP}\end{bmatrix} \\ \begin{bmatrix} \overline{+\text{et}} \\ -\text{Stem} = \text{PP} \\ \left\{\begin{array}{l}+\text{PP}\\+\text{Pst}\end{array}\right\}\end{bmatrix}\end{array}\right\} \\ [+\text{long}] \; / & \begin{bmatrix} +\text{Prs Um} \\ -\text{Pst} = \text{PP} \\ +\text{Pst} \\ \underline{\hspace{4em}}\end{bmatrix}\end{array}\right)$$

It will be remembered that a special subrule had to be incorporated into $(8''')$, the redundancy rule for stems in /ē/ and /e/, to prevent Type 8 stems from being marked [+Prs Um] (cf. § 1.5 above). This subrule can be done away with by reformulating $(8''')$ as follows:

$(8^{i''})$

$$\begin{bmatrix}\text{e}\\-\text{Reg}\end{bmatrix} \rightarrow \left\{\begin{array}{lll} [+\text{Prs Um}] & & \\ \left\{\begin{array}{l}\begin{bmatrix}-\text{Stem} = \text{PP}\\-\text{Pst} = \text{PP}\end{bmatrix}\\ [-\text{next rule}]\end{array}\right\} & / & \left\{\begin{array}{l} \underline{\hspace{2em}}\begin{bmatrix}+\text{cns}\\+\text{voc}\end{bmatrix} \; C_1 \\ \underline{\hspace{2em}}\begin{bmatrix}+\text{obs}\\-\text{voi}\\+\text{grv}\end{bmatrix}\end{array}\right\} \\ [-\alpha\text{Pst} = \text{PP}] & / & \begin{bmatrix}\overline{\hspace{5em}}\\ \alpha\text{Stem} = \text{PP}\end{bmatrix} \\ \begin{bmatrix}+\text{et}\\-\text{Prs Um}\\-\text{Stem} = \text{PP}\\+\text{Pst} = \text{PP}\end{bmatrix} & / & \underline{\hspace{2em}}[+\text{nsl}]\end{array}\right\}$$

1.61. Let us now consider the verb brĭngen 'bring', which has the following principal parts:

brĭngen, brăchte, gebrăcht, brĭngt

Notice the following three facts about this stem: first, it must be marked [+et]; second, unlike all other verbs with a stem in /ĭ[+nsl]C/, it does not exhibit the ablaut pattern i - a - u - i, and thus must be listed as an exception to (1") (cf. § 1.21); and third, it manifests the unique ablaut pattern i - a - a - i.

All of these facts can be explained by assuming that the underlying form of brĭngen is not /brĭng/ but rather /brĕng/ and modifying the umlaut rule (9") so that it will apply to /breng/ in the present tense and infinitive, changing /e/ to [i] in the presence of the feature [+Inf Um]. (This modification will be postponed until the final statement of (9") in the Appendix below.) Brĭngen will be marked [+Inf Um] in the lexicon. Below, I will show that stems of Types 9 and 10 must also be marked [+Inf Um]. Now all three special facts about brĭngen are accounted for: the marking [+et] will be predicted by (8^{iv}); (1") will not apply to the underlying /ĕ/ of /brĕng/; and the [ă] of the past tense and past participle will be derived by $(13''')$, which applies to all Type 8 verbs.

As I indicated above (cf. § 1.4), the umlaut rule will not be used only for brĭngen, but also for the Type 6c verbs li͞egen 'lie', bĭtten 'request', and sĭtzen 'sit', which behave like stems of Type 6a or 6b except for the vowel [ī] or [ĭ] in the present and infinitive.[36]

Therefore, I will set up the underlying forms /brĕng/, /lēg/, /bēt/, and /zĕs/ (cf. Sessel 'chair') for brĭngen, li͞egen, bĭtten, and sĭtzen, respectively, and mark each [+Inf Um] in the lexicon.

1.7. There are six verbs which must be marked [+Modal] in the lexicon to account for their special syntactic properties:[37]

dü̆rfen	'be allowed to',	*dü̆rfte*,	*gedü̆rft*,	*dărf*
kö̆nnen	'be able to',	*kö̆nnte*,	*gekö̆nnt*,	*kănn*
mȫgen	'may',	*mö̆chte*,	*gemö̆cht*,	*māg*
mü̆ssen	'have to',	*mü̆sste*,	*gemü̆sst*,	*mŭss*
sŏllen	'ought to',	*sŏllte*,	*gesŏllt*,	*sŏll*
wŏllen	'want to',	*wŏllte*,	*gewŏllt*,	*wĭll*

With the exception of the last two verbs, these all exhibit an umlauted vowel in the infinitive and present tense, 1st and 3rd person plural. As far as I can see, there is no way to account for the present stem alternants in the singular, nor for the absence of umlaut in the 2nd person plural present of *dü̆rfen*, *kö̆nnen* and *mü̆ssen* (*ihr durft*, *ihr konnt*, and *ihr musst*, respectively). I will account for the *u-ü* and *o-ö* alternations by setting base forms with non-umlauted vowels and marking these 4 modals with the feature [+Inf Um].

One further idiosyncrasy having to do with the modals is the fact that they do not have the normal 1st and 3rd person singular present tense inflections *-e* and *-et* (cf. § 0.0 above). This irregularity, which is peculiar only to the modals and to the verb *wĭssen* 'know', can be marked by the feature [±tPres]. All verbs will be specified for [+ t Pres] (cf. § 2), then (20) will specify that modals are [-t Pres]. The verb *wĭssen* must be entered as [-t Pres] in the lexicon.

Rule (20) specifies all relevant special features of the Modals except their irregular present tense vowels:

$$(20)\qquad [+\text{Modal}] \rightarrow \left\{\begin{array}{l} [-\text{next rule}] \;/\; \underline{\quad}\;\begin{bmatrix}+\text{voc}\\-\text{cnt}\end{bmatrix} \\[1em] [+\text{Inf Um}] \\[1em] \begin{bmatrix}-\text{Reg}\\+\text{et}\\-\text{t Pres}\\+\text{Stem} = \text{PP}\\+\text{Pst} = \text{PP}\end{bmatrix}\end{array}\right\}$$

The rules for 1st and 3rd person inflection could be formulated as follows (subscripted braces indicate parallel choice in each pair of braces with the same subscript. If the kth line is chosen in one pair of braces with the subscript 1, the kth line must be chosen in each such pair):

(21) 1st Person Inflection

$$\emptyset \rightarrow \left\{\begin{array}{l} [-\text{next rule}] \;/\; \begin{bmatrix} \rule{3em}{0.4pt} \\ +\text{Sing} \\ \left\{\begin{array}{l}\begin{bmatrix}-\text{t Pres}\\+\text{Pres}\end{bmatrix}\\ \begin{bmatrix}-\text{et}\\+\text{Pst}\end{bmatrix}\end{array}\right\}\end{bmatrix} \\[1em] {}_1\left\{\begin{array}{l}\breve{\text{e}}\\ \breve{\text{e}}\text{n}\end{array}\right\}_1 \;/\; [_{\text{Stem}}] + (\text{et}) + \underline{\quad} \;/\; {}_1\begin{bmatrix}\rule{3em}{0.4pt}\\ \left\{\begin{array}{l}+\text{sing}\\-\text{sing}\end{array}\right\}\end{bmatrix}_1 \end{array}\right\} \;/\; \begin{bmatrix}\rule{2em}{0.4pt}\\+\text{1st}\end{bmatrix}$$

(22) 3rd Person Inflection

$$\emptyset \rightarrow \left\{\begin{array}{l} [-\text{next rule}] \;/\; \begin{bmatrix} \rule{3em}{0.4pt} \\ +\text{Sing} \\ \left\{\begin{array}{l}\begin{bmatrix}-\text{tPres}\\+\text{Pres}\end{bmatrix}\\ \begin{bmatrix}-\text{et}\\+\text{Pst}\end{bmatrix}\end{array}\right\}\end{bmatrix} \\[1em] {}_1\left\{\begin{array}{c} {}_2\left\{\begin{array}{c}\breve{\text{e}}\text{t}\\ \breve{\text{e}}\end{array}\right\}_2 \\ \breve{\text{e}}\text{n}\end{array}\right\}_1 \;/\; [_{\text{Stem}}] + (\breve{\text{e}}\text{t}) + \underline{\quad} \;/\; \begin{bmatrix}\rule{4em}{0.4pt}\\ {}_1\left\{\begin{array}{c} {}_2\begin{bmatrix}+\text{sing}\\ \left\{\begin{array}{l}+\text{Pres}\\+\text{Pst}\end{array}\right\}\end{bmatrix}_2 \\ [-\text{sing}]\end{array}\right\}_1\end{bmatrix} \end{array}\right\} \;/\; \begin{bmatrix}\rule{2em}{0.4pt}\\+\text{3rd}\end{bmatrix}$$

But clearly (21) and (22) share so many environmental restrictions that it is more economical to express their similarities in (23) and their differences in (24).

(23) 1st - 3rd Person Inflection

$$\emptyset \rightarrow \left\{ \begin{matrix} [-\text{next rule}] \;/\; \begin{bmatrix} \underline{\qquad} \\ +\text{Sing} \\ \left\{ \begin{matrix} \begin{bmatrix} -\text{t Pres} \\ +\text{ Pres} \end{bmatrix} \\ \begin{bmatrix} -\text{et} \\ +\text{Pst} \end{bmatrix} \end{matrix} \right\} \end{bmatrix} \\ \\ {}_{1}\left\{ \begin{matrix} \breve{e} \\ \\ \breve{e}\text{n} \end{matrix} \right\}_{1} \;/\;]_{\text{Stem}} + (\text{et}) + \underline{\qquad} \end{matrix} \right\} \Big/ \begin{bmatrix} \underline{\qquad} \\ \left\{ \begin{matrix} +\text{1st} \\ +\text{3rd} \end{matrix} \right\} \\ {}_{1}\left\{ \begin{matrix} +\text{sing} \\ \\ -\text{sing} \end{matrix} \right\}_{1} \end{bmatrix}$$

(24) t Present

$$\emptyset \rightarrow \text{t} \;/\;]_{\text{Stem}} + (\breve{e}\text{t}) + \breve{e} \begin{bmatrix} \underline{\qquad} \\ +\text{Pres} \\ +\text{sing} \\ +\text{3rd} \\ +\text{Indic} \\ +\text{t Pres} \end{bmatrix}$$

The rule for second person inflections is simpler:

(25) 2nd Person Inflection

$$\emptyset \rightarrow \breve{e} \, {}_{1}\left\{ \begin{matrix} \text{s} \\ \emptyset \end{matrix} \right\}_{1} \text{t} \quad / \quad]_{\text{Stem}} + \; (\breve{e}\text{t}) \; + \begin{bmatrix} \underline{\qquad} \\ +\text{2nd} \\ {}_{1}\left\{ \begin{matrix} +\text{sing} \\ -\text{sing}, \end{matrix} \right\}_{1} \end{bmatrix}$$

1.8. There are seven[38] other stems which must be marked [+Inf Um]

Type 10a *lǖgen*, *lōg*, *gelōgen*, *lǖgt* 'lie'; -*trǖgen* (cf. *betrǖgen* 'deceive')

Type 10b *schwȫren*, *schwōr*, *geschwȫren*, *schwȫrt* 'swear'

Type 10c -*lŏschen*, -*lŏsch*, -*lŏschen*, -*lĭscht* (cf. *erlö̆schen* 'extinguish')

Type 10d. -wǟgen, -wōg,-wōgen, wǟgt (cf. erwǟgen 'consider');
schwǟren, schwōr, geschwōren, schwǟrt (or (obs.) schwīert) 'suppurate';
gǟren 'ferment'

The four stems of Types 10a-c have a non-compact back vowel in their underlying form, as do all the modals. There is only one other stem whose underlying vowel is of this kind, tūn 'do', which is suppletive on other grounds. So a rule suggests itself which expresses the similarities between Type 9 and Types 10a-c:

$$(26)\quad \begin{bmatrix} \text{V} \\ \text{-Reg} \\ \text{-cmp} \\ \text{+grv} \end{bmatrix} \rightarrow \left\{ \begin{matrix} \text{[-next rule]} \;\; / \;\; \text{——} \begin{bmatrix} \text{+voc} \\ \text{-cnt} \end{bmatrix} \\ \text{[+Inf Um]} \\ \begin{bmatrix} \text{+Stem = PP} \\ \text{+Pst = PP} \end{bmatrix} \end{matrix} \right\}$$

The vowel [ō] which appears in stems of Type 10d can be derived by adding the feature [-cmp] to the right side of the lower line of (2") as follows:

(2''') Lowering

$$\begin{bmatrix} \text{V} \\ \text{-Reg} \\ \text{-et} \\ \text{+grv} \end{bmatrix} \rightarrow \left\{ \begin{matrix} \text{[-next rule]} \;\; / \;\; \text{——} \; \text{[+nsl]} \; C_1 \\ \\ \begin{bmatrix} \text{-dff} \\ \text{-cmp} \end{bmatrix} \;\; / \;\; \begin{bmatrix} \overline{\qquad\qquad\qquad} \\ \text{-Stem = PP} \\ \left\{ \begin{matrix} \text{+PP} \\ \begin{bmatrix} \text{+Pst} \\ \text{+Pst = PP} \end{bmatrix} \end{matrix} \right\} \end{bmatrix} \end{matrix} \right\}$$

But (2''') must receive one final modification so that it will correctly apply to the past tense and past participle of lügen 'lie' and betrügen 'deceive', which are marked [+Stem = PP]. Rule (2''') applies to all back vowels whose stems are marked

[-et] except to the [a] in the past participle of Type 3 verbs. Type 3 verbs are unique in sharing the features [-et, +Stem = PP, -Inf Um], so a rule specifying these features in a negative environment can be set up.

(2^{iv}) Lowering

$$\begin{bmatrix} \text{V} \\ \text{-Reg} \\ \text{-et} \\ \text{+grv} \end{bmatrix} \rightarrow \left\{ \begin{array}{lcl} [\text{-next rule}] & / & \left\{ \begin{array}{l} \underline{\quad} \; [\text{+nsl}]C_1 \\ \begin{bmatrix} \overline{} \\ \text{+Stem = PP} \\ \text{-Inf Um} \end{bmatrix} \end{array} \right\} \\ \begin{bmatrix} \text{-dff} \\ \text{-cmp} \end{bmatrix} & / & \begin{bmatrix} \overline{} \\ \left\{ \begin{array}{l} \text{+PP} \\ \begin{bmatrix} \text{+Pst} \\ \text{+Pst = PP} \end{bmatrix} \end{array} \right\} \end{bmatrix} \end{array} \right\}$$

At present, I can see no way of modifying the umlaut rule (9") so that it will derive the [ǐ] of lischt and the [ī] of (obs) schwīert. Nor can I see a way of predicting that erwǟgen, gǟren, and schwǟren are [-Stem = PP, +Pst = PP], while Type 3b stems, which also have a monophthongal /a/ in their base forms, are [+Stem = PP, -Pst = PP]. It seems that the stems of Type 10d must be marked for all their Ablaut features in the lexicon. In short, there is little redundancy to be taken advantage of in stems of Type 10.

1.9. Since all rules affecting vowels have been discussed by now, a restatement of the final versions of all rules in the correct order (except for those rules which redundantly predict morphological features on the basis of underlying vowels - rules (1"), (5), (11), (6'), (8^{iv}), (20) and (26), which will be discussed in §2) may prove useful. Following the list of the rules, which will be given not in their full form, but only by their number and name and by an abbreviated indication of the operation they perform, I will give sample derivations for some principal parts of various types of stems. The last form derived is in a transcription which represents segments which are fairly close to the phonetic output.

1.91. List of Ordered Rules

A. Inflection Rules

Section(s) discussed:

(17) Past Tense Inflection: $\emptyset \to \breve{e}t$ 1.6

(18) Past Participle Inflection: $\emptyset \to g\breve{e}+\ldots+\left\{\begin{matrix}\breve{e}n\\ \breve{e}t\end{matrix}\right\}$ 1.6

(23) 1st-3rd Person Inflection: $\emptyset \to \left\{\begin{matrix}\breve{e}\\ \breve{e}n\end{matrix}\right\}$ 1.7

(24) t Present: $\emptyset \to t$ 1.7

(25) 2nd Person Inflection: $\emptyset \to \breve{e}\left\{\begin{matrix}s\\ \emptyset\end{matrix}\right\}t$ 1.7

B. Vowel Alternation Rules

(4'') Backing: $\left\{\begin{matrix} i \to u \\ e \to o \\ a \to \text{ɔ} \end{matrix}\right\} \Big/ \left[\begin{matrix} \overline{\qquad\qquad} \\ -\text{Stem} = \text{PP} \\ \left\{\begin{matrix} +\text{PP} \\ +\text{Nominal} \\ \left[\begin{matrix} +\text{Pst} \\ +\text{Pst} = \text{PP} \end{matrix}\right] \end{matrix}\right\} \end{matrix}\right]$ 1.21

(13''') Past Tense I: $\left\{\begin{matrix} \text{æ} \to \bar{i} \\ \text{ɔ} \to \bar{u} \\ i \to \text{æ} \\ e \to \left[\begin{matrix}+\text{cmp}\\ +\text{dff}\end{matrix}\right] \end{matrix}\right\} \Big/ \left\{\begin{matrix} \left[\begin{matrix} \overline{\qquad} \\ +\text{Pst} \\ -\text{Pst} = \text{PP} \end{matrix}\right] \\ \left[\begin{matrix} \overline{\qquad\qquad} \\ +\text{et} \\ -\text{Stem} = \text{PP} \\ \left\{\begin{matrix}+\text{PP}\\ +\text{Pst}\end{matrix}\right\} \end{matrix}\right] \end{matrix}\right\}$ 1.512; 1.513; 1.6

(12) Past Tense II: (diphthongs) $\left\{\begin{matrix} ay \to \bar{i} \\ aw \to \bar{u} \end{matrix}\right\}$ 1.511

(2^{iv}) Lowering: $\begin{matrix} u \to o \\ \text{ɔ} \to o \end{matrix}$ 1.1; 1.21; 1.8

(14) Compact Vowel Adjustment: $\left\{\begin{matrix} \text{æ} \\ \text{ɔ} \end{matrix}\right\} \to a$ 1.512

(9") Umlaut: $\left\{\begin{matrix} e \rightarrow i \\ u \rightarrow ü \\ o \rightarrow ö \\ a \rightarrow æ \end{matrix}\right\}$ 1.41; 1.43; 1.61

(10) Special Past Subjunctive: $æ \rightarrow \left\{\begin{matrix} ö\ /\text{—}l \\ ü\ /\text{—}r \end{matrix}\right\}$ 1.43

(16) Shortening: $V \rightarrow [\text{-long}]\ /\ \text{—}\ [\text{-voi}]$ 1.22; 1.52

(15) Cluster Shortening: $V \rightarrow [\text{-long}]\ /\ \text{—} \begin{bmatrix}\text{-obs} \\ \text{+cns}\end{bmatrix} C_1$ 1.514

1.911. Briefly, the reasons for ordering the rules as above are the following:

a. The Inflection Rules (A) are not ordered with respect to the Vowel Alternation Rules (B): the order given above is arbitrary and of no consequence.

b. Among rules (A) there are only two orderings which are fixed: to get the simplest set of rules,

  i. (17) Past Tense Inflection must precede (23), (24) and (25), because the morphemes marking persons are added to the end of the stem or to the stem followed by the regular past tense morpheme ĕt.

  ii. (24) must follow (23).

c. Among rules B, the ordering is more rigid for the simplest set of rules:

  i. (4") Backing and (13''') Past Tense I, while unordered among themselves, must both precede (12) Past Tense II. The reasons why (13''') must precede (12) are discussed above in § 1.513; (4") must precede (12) or the rules would derive *geblōben instead of geblīeben as the past participle of *bleiben*, as in the following derivation:

gĕ+blayb+ĕn $\xrightarrow{12}$ gĕ+blīb+ĕn $\xrightarrow{4''}$
gĕ+blūb+ĕn $\xrightarrow{2^{iv}}$ *gĕblōbĕn

The correct derivation is

gĕ+blayb+ĕn $\xrightarrow{4''}$ gĕ+blɔyb+ĕn $\xrightarrow{12}$ gĕblīb+ĕn.

ii. (2^{iv}), *Lowering*, must follow (12), *Past Tense II*, because the [ō] in *gesōgen*, the past participle of *sa^{u}gen*, which is derived by (12), results from ū by the application of (2^{iv}). Thus

gĕ+zawg+ĕn $\xrightarrow{4''}$ gĕ+zɔwg+ĕn $\xrightarrow{12}$ gĕ+zūg+ĕn $\xrightarrow{2^{iv}}$
gĕzōgĕn

iii. (14), *Compact Vowel Adjustment*, must follow (2^{iv}), *Lowering*; for the latter converts the [ɔ̄] of *erwägen* to [ō] in the past tense and past participle. Thus,

erwōg: /ĕr+vāg/ $\xrightarrow{4''}$ ĕr+vɔ̄g $\xrightarrow{2^{iv}}$ ĕr+vōg $\xrightarrow{14}$
(does not apply) → ĕrvōg

If (2^{iv}) were to follow (14), the incorrect **ĕrwāg* would result.

iv. (14), *Compact Vowel Adjustment*, must precede (9"), *Umlaut*; or the vowel [æ], which results from [a] by the operation of the umlaut rule, would be reconverted into [a].

v. It is clear that (10), *Special Past Subjunctive*, must follow (9"), *Umlaut*; for otherwise (10) would have to duplicate part of (9"), i.e., the part specifying that

$$V \rightarrow [-\text{grv}]$$

would have to be included.

Rule (10) is, however, unordered with respect to all other rules which follow (12): its second-to-last position in the ordering is arbitrary.

vi. (16), Shortening, which shortens the vowels of Type 2 and 7 stems if they precede a [-voi] segment, must follow (12), Past Tense II; for it is only after the operation of this latter rule that a true vowel precedes the consonants of Type 7 stems - before then, they are preceded by a glide. If (16) were to precede (12), (12) would have to incorporate a shortening into its operation, as follows:

$$\underset{1}{\begin{bmatrix} V \\ -\text{Reg} \\ \begin{Bmatrix} +\text{Pst} \\ +\text{PP} \end{Bmatrix} \end{bmatrix}} - \underset{2}{\begin{bmatrix} -\text{cns} \\ -\text{voc} \end{bmatrix}} - \underset{3}{[\alpha\ \text{voi}]} \Rightarrow \emptyset \quad \begin{bmatrix} 2 \\ \alpha\ \text{long} \end{bmatrix} -3$$

This is of course possible, but it takes a slightly greater number of feature specifications than the solution I have adopted.

vii. Rule (15), Cluster Shortening, must follow (13"""), as was demonstrated in 1.514. Otherwise, it is unordered with respect to the other rules. It and (16) are collapsed into one rule in the Appendix.

1.92. Sample Derivations

In these derivations, I will derive only 2nd person singular forms of finite verbs, for the sake of convenience. If a principal part of some stem has the same vowel as the underlying vowel of the stem, I will not bother to illustrate its derivation (i.e., I will not show derivations for *brĕchĕn*, *fĭndĕst*, *gĕlēsĕn*, etc.) When a rule does not apply to a form, I will in general not even mention the rule number, and instead just go on to the next applicable rule, unless it seems important to note the non-applicability of some particular rule.

Type 1a *fandest*: /fĭnd/ $\xrightarrow{25}$ fĭnd+ĕst $\xrightarrow{13'''}$ fæ̆nd+ĕst $\xrightarrow{14}$ făndĕst

gĕfŭndĕn: /fĭnd/ $\xrightarrow{18}$ gĕ+fĭnd+ĕn $\xrightarrow{4''}$ gĕ+fŭnd+ĕn $\xrightarrow{2^{iv}}$ (does not apply)... → gĕfŭndĕn

Type 1b *schwămmst*: /švĭm/ $\xrightarrow{25}$ švĭm+ĕst $\xrightarrow{13'''}$ švæ̆m+ĕst $\xrightarrow{14}$ švăm+ĕst (syncope drops the [ĕ] here to produce [švămst])

gĕschwŏmmĕn: /švĭm/ $\xrightarrow{18}$ gĕ+švĭm+ĕn $\xrightarrow{4''}$ gĕ+švŭm+ĕn $\xrightarrow{2^{iv}}$ gĕšvŏmĕn

Type 2a *flōgst*: /flīg/ $\xrightarrow{25}$ flīg+ĕst $\xrightarrow{4''}$ flūg+ĕst $\xrightarrow{2^{iv}}$ flōg+ĕst $\xrightarrow{16}$ does not apply → (syncope) flōgst

gĕflōgĕn: /flīg/ $\xrightarrow{18}$ gĕ+flīg+ĕn $\xrightarrow{4''}$ gĕ+flūg+ĕn $\xrightarrow{2^{iv}}$ gĕ+flōg+ĕn $\xrightarrow{16}$ does not apply → gĕflōgĕn

Flūg: /flīg/ $\xrightarrow{4''}$ flūg $\xrightarrow{2^{iv}}$ does not apply $\xrightarrow{16}$ does not apply → flūg

Type 2b *gĕnŏssĕst*: /gĕ+nīs/ $\xrightarrow{25}$ gĕ+nīs+ĕst $\xrightarrow{4''}$ gĕ+nūs+ĕst $\xrightarrow{2^{iv}}$ gĕ+nōs+ĕst $\xrightarrow{16}$ gĕnŏsĕst → (in some dialects, syncope yields) gĕnŏsst

gĕnŏssĕn: /gĕ+nīs/ $\xrightarrow{18}$ gĕ+gĕ+nīs+ĕn $\xrightarrow{4''}$ gĕ+gĕ+nūs+ĕn $\xrightarrow{2^{iv}}$ gĕ+gĕ+nōs+ĕn $\xrightarrow{16}$ gĕ+gĕ+nŏs+ĕn [39]

Gĕnŭss: /gĕ+nīs/ $\xrightarrow{4''}$ gĕ+nūs $\xrightarrow{2^{iv}}$ does not apply $\xrightarrow{16}$ gĕnŭs

Type 3a fielst: /făl/ $\xrightarrow{6''}$ fæ̆l^{40} $\xrightarrow{25}$ fæ̆l+ĕst $\xrightarrow{13'''}$ fīl+ĕst → (syncope) fīlst

fällst: /făl/ $\xrightarrow{25}$ făl+ĕst $\xrightarrow{9''}$ fæ̆l+ĕst → (syncope and the rule merging [ĕ] and [æ̆] result in the form [fĕlst])

Type 3b būkst: /băk/ $\xrightarrow{6''}$ bɔ̆k $\xrightarrow{25}$ bɔ̆k+ĕst $\xrightarrow{13'''}$ būk+ĕst → (syncope) būkst

băckst: /băk/ $\xrightarrow{25}$ băk+ĕst $\xrightarrow{9''}$ bæ̆k+ĕst → (syncope) bĕkst (cf. fällst)

Type 4 sprĭchst: /šprĕx/ $\xrightarrow{25}$ šprĕx+ĕst $\xrightarrow{9''}$ šprĭx+ĕst → (syncope) šprĭxst

sprāchst: /šprĕx/ $\xrightarrow{25}$ šprĕx+ĕst $\xrightarrow{13'''}$ špr $\begin{bmatrix}+\text{long}\\+\text{cmp}\\+\text{dff}\end{bmatrix}$ x+ĕst $\xrightarrow{14}$ šprāx+ĕst → (syncope) šprāxst

gĕsprŏchĕn: /šprĕx/ $\xrightarrow{18}$ gĕ+šprĕx+ĕn $\xrightarrow{4''}$ gĕšprŏxĕn

sprǟchĕst: /šprĕx/ → (rule for formation of subjunctive not presented in text) šprĕx+ĕ $\xrightarrow{25}$ šprĕx+ĕ+ĕst $\xrightarrow{13'''}$ špr $\begin{bmatrix}+\text{long}\\+\text{cmp}\\+\text{dff}\end{bmatrix}$ x+ĕ+ĕst $\xrightarrow{14}$ šprāx+ĕ+ĕst $\xrightarrow{9''}$ šprǣx+ĕ+ĕst → (syncope) šprǣxĕst

stȫhlest: /štēl/ → (rule for subjunctive formation) štēl+ĕ $\xrightarrow{25}$ štēl+ĕ+ĕst $\xrightarrow{13'''}$ št $\begin{bmatrix}+\text{long}\\+\text{cmp}\\+\text{dff}\end{bmatrix}$ l+ĕ+ĕst $\xrightarrow{14}$ štāl+ĕ+ĕst $\xrightarrow{9''}$ štǣl+ĕ+ĕst $\xrightarrow{10}$ štȫl+ĕ+ĕst → (syncope) štȫlĕst

wŭrdĕst: /vĕrd́/ → (rule for subjunctive formation) vĕrd́+ĕ $\xrightarrow{25}$ vĕrd́+ĕ+ĕst $\xrightarrow{13'''}$ v $\begin{bmatrix}+\text{long}\\+\text{cmp}\\+\text{dff}\end{bmatrix}$ rd́+ĕ+ĕst $\xrightarrow{14}$ vārd+ĕ+ĕst $\xrightarrow{9''}$ vǣrd́+e+est $\xrightarrow{10}$ vūrd́+e+est → (syncope) and

Type 5a schōrst: /šēr/ $\xrightarrow{25}$ šēr+ĕst $\xrightarrow{4''}$ šōr+ĕst → (syncope) šōrst

gĕschōrĕn: /šēr/ $\xrightarrow{18}$ gĕ+šēr+ĕn $\xrightarrow{4''}$ gĕšōrĕn

schīerst: /šēr/ $\xrightarrow{25}$ šēr+ĕst $\xrightarrow{9''}$ šīr+ĕst → (syncope) šīrst

Type 5b hēbst: /hēb/ $\xrightarrow{25}$ hēb+ĕst $\xrightarrow{9''}$ does not apply[41] → (syncope) hēbst

Type 6a lāsĕst: /lēz/ $\xrightarrow{25}$ lēz+ĕst $\xrightarrow{13'''}$ $l\begin{bmatrix}+\text{long}\\+\text{cmp}\\+\text{dff}\end{bmatrix}$ z+ĕst $\xrightarrow{14}$ lāzĕst

līest: /lēz/ $\xrightarrow{25}$ lēz+ĕst $\xrightarrow{9''}$ līz+ĕst → (syncope) līzst (eventually [līst])

frāsst: /frĕs/ $\xrightarrow{25}$ frĕs+ĕst $\xrightarrow{13'''}$ $fr\begin{bmatrix}+\text{long}\\+\text{cmp}\\+\text{dff}\end{bmatrix}$ s+ĕst $\xrightarrow{14}$ frās+ĕst → (syncope) frāsst (eventually [frāst])

Type 6c līegst: /lēg/ $\xrightarrow{25}$ lēg+ĕst $\xrightarrow{9''}$ līgĕst → (syncope) līgst

Type 7a blīebst: /blayb/ $\xrightarrow{25}$ blayb+ĕst $\xrightarrow{4''}$ blɔyb+ĕst $\xrightarrow{13'''}$ (does not apply) $\xrightarrow{12}$ blīb+ĕst $\xrightarrow{2^{iv}}$ (does not apply[42]) $\xrightarrow{16}$ (does not apply) → (syncope) blībst

gĕblīebĕn: /blayb/ $\xrightarrow{18}$ gĕ+blayb+ĕn $\xrightarrow{4''}$ gĕ+blɔyb+ĕn $\xrightarrow{12}$ gĕ+blīb+ĕn $\xrightarrow{2^{iv}}$ (does not apply[42]) $\xrightarrow{16}$ (does not apply) → gĕblībĕn

Type 7b grĭffst: /grayf/ $\xrightarrow{25}$ grayf+ĕst $\xrightarrow{4''}$ grɔyf+ĕst $\xrightarrow{13'''}$ (does not apply) $\xrightarrow{12}$ grīf+ĕst $\xrightarrow{2^{iv}}$ (does not apply[42]) $\xrightarrow{16}$ grĭf+ĕst → (syncope) grĭfst

gĕgrĭffĕn: /grayf/ $\xrightarrow{18}$ gĕ+grayf+ĕn $\xrightarrow{4''}$ gĕ+grɔyf+ĕn $\xrightarrow{12}$ gĕ+grīf+ĕn $\xrightarrow{2^{iv}}$ (does not apply[42]) $\xrightarrow{16}$ gĕgrĭfĕn

Type 7c sōgst: /zawg/ $\xrightarrow{25}$ zawg+ĕst $\xrightarrow{4''}$ zɔwg+ĕst $\xrightarrow{13'''}$ (does not apply) $\xrightarrow{12}$ zūg+ĕst $\xrightarrow{2^{iv}}$ zōg+ĕst $\xrightarrow{16}$ (does not apply) → (syncope) zōgst gĕsōgĕn: /zawg/ $\xrightarrow{18}$ gĕ+zawg+ĕn $\xrightarrow{4''}$ gĕ+zɔwg+ĕn $\xrightarrow{12}$ gĕ+zūg+ĕn $\xrightarrow{2^{iv}}$ gĕ+zōg+ĕn $\xrightarrow{16}$ (does not apply) → gĕzōgĕn

Type 7d sŏffst: /zawf/ $\xrightarrow{25}$ zawf+ĕst $\xrightarrow{4''}$ zɔwf+ĕst $\xrightarrow{13'''}$ (does not apply) $\xrightarrow{12}$ zūf+ĕst $\xrightarrow{2^{iv}}$ zōf+ĕst $\xrightarrow{16}$ zŏf+ēst → (syncope) zŏfst

gĕsŏffĕn: /zawf/ $\xrightarrow{18}$ gĕ+zawf+ĕn $\xrightarrow{4''}$ gĕ+zɔwf+ĕn $\xrightarrow{13'''}$ (does not apply) $\xrightarrow{12}$ gĕ+zūf+ĕn $\xrightarrow{2^{iv}}$ gĕ+zōf+ĕn $\xrightarrow{16}$ gĕzŏfĕn

Type 8 brănntĕst: /brĕn/ $\xrightarrow{17}$ brĕn+ĕt $\xrightarrow{25}$ brĕn+ĕt+ĕst $\xrightarrow{4''}$ brŏn+ĕt+ĕst $\xrightarrow{13'''}$ br $\begin{bmatrix}+\text{cmp}\\+\text{dff}\end{bmatrix}$ n+ĕt+ĕst $\xrightarrow{14}$ brăn+ĕt+ĕst → (syncope) brăntĕst

Type 10 lǖgst: /lūg/ $\xrightarrow{25}$ lūg+ĕst $\xrightarrow{9''}$ lǖg+ĕst → (syncope) lǖgst

gĕlōgĕn: /lūg/ $\xrightarrow{18}$ gĕ+lūg+ĕn $\xrightarrow{2^{iv}}$ gĕ+lōg+ĕn $\xrightarrow{9''}$ (does not apply) → gĕlōgĕn

ĕrwǟgst: /ĕr+vāg/ $\xrightarrow{25}$ ĕr+vāg+ĕst $\xrightarrow{4''}$ ĕr+vɔ̄g+ĕst $\xrightarrow{14}$ ĕr+vāg+ĕst $\xrightarrow{9''}$ ĕr+vǣg+ĕst → (syncope) ĕrvǣgst

ĕrwōgst: /ĕr+vāg/ $\xrightarrow{25}$ ĕr+vāg+ĕst $\xrightarrow{4''}$ ĕr+vɔ̄g+ĕst $\xrightarrow{2^{iv}}$ ĕr+vōg+ĕst $\xrightarrow{14}$ (does not apply) → (syncope) ĕrvōgst

2.0 In this section, I will review and restate the redundancy rules (1"), (5), (11), (6'), (8^{iv}), (20) and (26) which were discussed in §1, and introduce two additional rules. These rules assign verbs redundant morphological features on the basis of phonological or syntactic characteristics of the stem.

(1"), as formulated in §1.21 above, needs no further discussion. It is already practically in its final form.

(11), which was formulated in connection with Type 7 stems, where the underlying /a/ is followed by a $\begin{bmatrix}\text{-cns}\\ \text{-voc}\end{bmatrix}$ segment, and (5), which was formulated for stems whose /a/ is followed by [+cns] segments, can be collapsed into one rule, (27). I repeat (11) and (5) here for convenience.

$$(11)\quad \begin{bmatrix}\text{V}\\ \text{-Reg}\end{bmatrix} \rightarrow \begin{bmatrix}\text{-Stem = PP}\\ \text{+Pst = PP}\\ \text{- Prs Um}\end{bmatrix} \;/\; \underline{\quad\quad} \begin{bmatrix}\text{-cns}\\ \text{-voc}\end{bmatrix}$$

$$(5)\quad \begin{bmatrix}\text{V}\\ \text{-Reg}\\ \text{+cmp}\end{bmatrix} \rightarrow \begin{bmatrix}\text{+Stem = PP}\\ \text{-Pst = PP}\\ \text{+Prs Um}\end{bmatrix} \;/\; \underline{\quad\quad}\; [\text{+cns}]$$

$$(27)\quad \begin{bmatrix}\text{V}\\ \text{-Reg}\\ \text{+cmp}\end{bmatrix} \rightarrow \begin{bmatrix}\alpha\text{Stem = PP}\\ -\alpha\text{Pst = PP}\\ \alpha\text{Prs Um}\end{bmatrix} \;/\; \underline{\quad\quad}[\alpha\ \text{cns}]\,\text{[43]}$$

To (27) can be added rule (6'), æ - ɔ, yielding (RR6) Redundancy Rule for Stems in a.

$$(6')\quad \begin{bmatrix}\text{V}\\ \text{-Reg}\\ \text{+cmp}\\ \text{+Pst}\end{bmatrix} \rightarrow \left\{\begin{matrix} [\text{+flt}] \;/\; \underline{\quad\quad}[\text{+cns}] \\ \\ \begin{bmatrix}\text{-flt}\\ \text{-grv}\end{bmatrix} / \;\underline{\quad\quad}\; \begin{bmatrix}\text{+cns}\\ \text{-grv}\\ \text{+dff}\\ \alpha\text{cnt}\\ \alpha\text{str}\end{bmatrix}\end{matrix}\right\}$$

(RR6) Redundancy Rule for Stems in a

$$\begin{bmatrix}\text{V}\\ \text{-Reg}\\ \text{+cmp}\end{bmatrix} \rightarrow \left\{\begin{matrix} \begin{bmatrix}\alpha\text{Stem = PP}\\ -\alpha\text{Pst = PP}\\ \alpha\text{Prs Um}\end{bmatrix} / \;\underline{\quad\quad}[\alpha\ \text{cns}] \\ \\ [\text{+flt}] \;/\; \underline{\quad\quad}\; [\text{+cns}] \\ \begin{bmatrix}\text{-flt}\\ \text{-grv}\end{bmatrix} / \;\underline{\quad\quad}\; \begin{bmatrix}\text{+cns}\\ \text{-grv}\\ \text{+dff}\\ \alpha\text{cnt}\\ \alpha\text{str}\end{bmatrix}\end{matrix}\right\}$$

(RR6) leaves out the feature [+Pst], which was specified in (6'), because even if [æ] and [ɔ] are produced by (RR6), if no feature [+Pst] is present, which would cause (13'''), *Past Tense I*, to convert them to [ī] and [ū], respectively, then (14), *Compact Vowel Adjustment*, will reconvert them to [a].

The other three rules, (8^{iv}), (20) and (26), are essentially in final form, subject to the following considerations. There should be, somewhere in the grammar, a rule specifying that all verbs are regular, unless noted otherwise in the lexicon. (RR1) is such a rule.

(RR1)

$$[+\text{verb}] \rightarrow \begin{bmatrix} +\text{Reg} \\ +\text{t Pres} \\ +\text{Stem} = \text{PP} \\ +\text{Pst} = \text{PP} \\ -\text{Prs Um} \\ -\text{Inf Um} \\ -\text{DM} \end{bmatrix}$$

That is, verbs are normally specified redundantly with the values of the features on the right side of the arrow. Exceptions will be noted as such in the lexicon, and after all verbs have been specified by (RR1) as being [+Reg], a DICTIONARY LOOKUP rule will change the feature [+Reg] to [-Reg], [+t Pres] to [-t Pres], etc., in particular stems, on the basis of the lexicon entries. E.g., *bringen* will first be marked [+reg] by (RR1), but then this mark will be changed to [-Reg] by the entry in the lexicon for *bringen*.[44]

(RR2) states that all [+reg] stems are inflected with *-ĕt* and *gĕ*+....+*ĕt*, and that no [-Reg] stems are. Later rules ((RR3) and (RR5)) modify this statement by specifying that stems of Types 8 and 9, though [-Reg], are [+et].

(RR2) $[\alpha\ \text{Reg}] \rightarrow [\alpha\ \text{et}]$

Since (RR1) has already specified all stems as [+Stem = PP] and [+Pst = PP], this information need not be repeated in (20). In the set of rules below, I have removed duplicated information from other rules in a similar fashion. The rules are ordered from (RR1) to (RR7), with the dictionary lookup of idiosyncratic information following (RR1) and preceding (RR2).

2.1. List of Rules

(RR1) (RR1)

$$[+\text{verb}] \rightarrow \begin{bmatrix} +\text{Reg} \\ +\text{t Pres} \\ +\text{Stem = PP} \\ +\text{Pst = PP} \\ -\text{Inf Um} \\ -\text{Pres Um} \\ -\text{DM} \end{bmatrix}$$

DICTIONARY LOOKUP

(RR2) (RR2)

$$[\alpha\,\text{Reg}] \rightarrow [\alpha\,\text{et}]$$

Section where rule was last discussed:

(RR3) (RR3)

$$[+\text{Modal}] \rightarrow \begin{bmatrix} -\text{Reg} \\ -\text{t Pres} \end{bmatrix}$$

1.7

(RR4) Redundancy Rule for Stems in *i*

$$\begin{bmatrix} -\text{grv} \\ +\text{dff} \end{bmatrix} \rightarrow \left\{ \begin{array}{ll} \text{a.} & [-\text{Stem = PP}] \\ \text{b.} & [-\text{Pst = PP}] \;/\; \underline{\quad}\,[+\text{nsl}] \end{array} \right\}$$

(RR5) Redundancy Rule for Stems in *e*

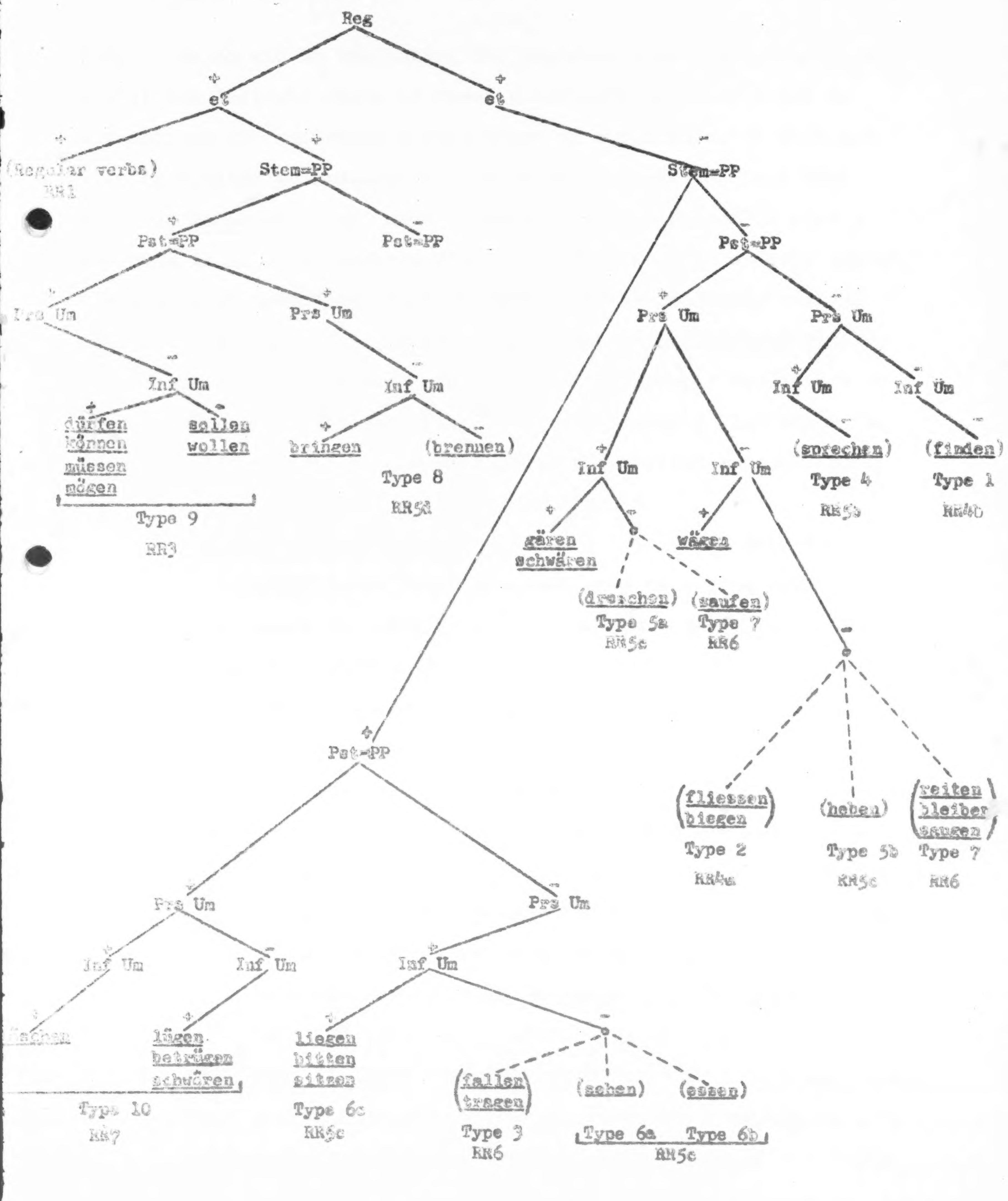
$$\begin{bmatrix} -\text{dff} \\ -\text{grv} \end{bmatrix} \rightarrow \left\{ \begin{array}{ll} \text{a.} & [+\text{Prs Um}] \\ \text{b.} & \begin{bmatrix} -\text{Stem = PP} \\ -\text{Pst = PP} \\ -\text{next rule} \end{bmatrix} \Big/ \left\{ \begin{array}{l} \underline{\quad}\begin{bmatrix} +\text{cns} \\ +\text{voc} \end{bmatrix} C_1 \\ \underline{\quad}\begin{bmatrix} +\text{obs} \\ +\text{grv} \\ -\text{voi} \end{bmatrix} \end{array} \right\} \\ \text{c.} & [\alpha\text{Pst = PP}] \;/\; \begin{bmatrix} \underline{\qquad\qquad} \\ -\alpha\text{Stem = PP} \end{bmatrix} \\ \text{d.} & \begin{bmatrix} +\text{et} \\ -\text{Prs Um} \\ -\text{Stem = PP} \\ +\text{Pst = PP} \end{bmatrix} \Big/ \; \underline{\quad}\,[+\text{nsl}] \end{array} \right\} \Bigg/ \begin{bmatrix} \underline{\quad} \\ \text{V} \\ -\text{Reg} \end{bmatrix}$$

1.6

$$
\left.
\begin{array}{l}
\text{(RR6)}\quad \underline{\text{Redundancy Rule for Stems in } a} \\[6pt]
[+\text{cmp}] \rightarrow
\begin{array}{l}
\text{a.} \\[10pt] \text{b.} \\[30pt] \text{c.}
\end{array}
\left\{
\begin{array}{lll}
\left[\begin{array}{c} \alpha\,\text{Stem} = \text{PP} \\ -\alpha\,\text{Pst} = \text{PP} \\ \alpha\,\text{Prs Um} \end{array}\right] & / \_\_\_ & [\alpha\text{cns}] \\
[+\text{flt}] & / \_\_\_ & [+\text{cns}] \\
\left[\begin{array}{c} -\text{flt} \\ -\text{grv} \end{array}\right] & / \_\_\_ & \left[\begin{array}{c} +\text{cns} \\ -\text{grv} \\ +\text{dff} \\ \alpha\,\text{cnt} \\ \alpha\,\text{str} \end{array}\right]
\end{array}
\right\} \\[6pt]
\text{(RR7)}\quad \underline{\text{Redundancy Rule for Stems in } \{\underline{o},\ \underline{u}\}} \\[6pt]
\left[\begin{array}{c} +\text{grv} \\ -\text{cmp} \end{array}\right] \rightarrow
\left\{
\begin{array}{l}
[-\text{next rule}] \;/\; \_\_\_ \left[\begin{array}{c} +\text{voc} \\ -\text{cnt} \end{array}\right] \\[10pt]
[+\text{Inf Um}]
\end{array}
\right\}
\end{array}
\right/
\begin{array}{c}
2.0 \\[20pt]
\left[\begin{array}{c} \overline{\quad\quad} \\ \text{V} \\ -\text{Reg} \end{array}\right] \\[20pt]
1.8
\end{array}
$$

2.2. It may prove helpful at this point to review the taxonomy which I have established on the basis of the six abstract features [±Reg], [±et], [±Stem = PP], [±Pst = PP], [±Prs Um] and [±Inf Um]. (The features [±t Pres] and [±DM] have been disregarded for the present purpose.) The feature tree in Fig. 1 exhibits the 15 actually occurring feature bundles of 64 logically possible ones. Words in parentheses are symbols for the class of like verbs: '(*finden*)' signifies the whole class of Type 1 verbs. When a column of words not enclosed in parentheses is given, this is to be understood to mean that the column constitutes an exhaustive list; thus, *dürfen*, *können*, *mögen* and *müssen* are all the verbs that have the features [-Reg, +et, +Stem = PP, +Pst = PP, -Prs Um, +Inf Um] in common. In two cases, dotted lines connect the terminal node on a branch to three classes of verbs that are not distinguished among themselves on the basis of the six-feature taxonomy. That is, Types 2 (*biegen*, *fliessen*), 5b (*heben*) and 7 (*bleiben*, *reiten*, *sangen*) are unique in having the features [-Reg, -et, -Stem = PP, +Pst = PP, -Prs Um, -Inf Um] in common. Similarly, Types 3 (fallen, tragen), 6a (sehen) and 6b (essen) are unique in having the features [-Reg, -et, +Stem = PP, -Pst = PP, +Prs Um, -Inf Um] in common; also, Type 5a (dreschen) and the verb saufen have in common the features [-Reg, -et, -Stem = PP, +Pst = PP, +Prs Um, -Inf Um]. Under each word or class of words I have listed its type and the number of the redundancy rule which applies to this type, if any. Other features of the tree should be self-explanatory.

Figure 1: Feature Tree


Reg
+ et
+ et
+ (Regular verbs)
RR1
+ Stem=PP
− Stem=PP
+ Pst=PP
− Pst=PP
+ Prs Um
− Inf Um
+ dürfen
können
müssen
mögen
− sollen
wollen
Type 9
RR3
+ Prs Um
− Inf Um
+ bringen
− (brennen)
Type 8
RR5a
− Pst=PP
+ Prs Um
+ Inf Um
+ gären
schwären
− (dreschen)
Type 5a
RR5c
(saufen)
Type 7
RR6
− Inf Um
+ wägen
−
(fliessen)
biegen
Type 2
RR4a
(heben)
Type 5b
RR5c
(reiten
bleiben
saugen)
Type 7
RR6
− Prs Um
+ Inf Um
− (sprechen)
Type 4
RR5b
− Inf Um
− (finden)
Type 1
RR4b
+ Pst=PP
+ Prs Um
+ Inf Um
+ äschen
− Inf Um
+ lügen
betrügen
schwören
Type 10
RR7
− Prs Um
+ Inf Um
+ liegen
bitten
sitzen
Type 6c
RR5c
−
(fallen)
(tragen)
Type 3
RR6
(sehen)
(essen)
Type 6a
Type 6b
RR5c

3.0. As an aid in evaluating the analysis I have proposed above, I will now list all cases of vowel alternants which my rules do not account for and which I must treat as suppletive. I will not list exceptions to redundancy rules here, such as the fact that the verb *schinden* 'flay' must be marked in the lexicon in such a way that it does not undergo (RR4b). (If it were to undergo (RR4b), the incorrect past tense form **schand* would be produced, instead of the correct *schund*.) In such cases, the correct *Ablaut* pattern can be achieved by imposing additional idiosyncratic conditions on the rules given in §1 and §2. But in the cases I list below, no independently motivated rule will yield the correct pattern, no matter what constraints are imposed on them.

a. *sein* -- *war* -- *gewesen* -- *ist* 'be'. For this stem it might be profitable to set up a base form /vēz/, which would resemble Type 6a stems (such as *lēsen*) in that the past tense vowel is a long [ā] and the vowel of the 2nd and 3rd person singular present is [ĭ] (a special statement would have to be added which specified that the /v/ is deleted in the 3rd person singular present and made [-cont] in the 1st and 2nd person singular present(. Furthermore, the [i] appearing in the present tense would have to be shortened by a special rule.) A stem /vēz/ will be necessary anyway in order to produce such forms as *Wēsen* 'being', *abwēsend* 'absent', etc.

b. *hāben* - *hătte* - *gĕhăbt* - *hăt* 'have'. This stem, /hāb/, I will consider to be [+Reg], for the redundancy rule applying to [-Reg] stems in /a/ (RR6) does not apply

2

to it, and it is conjugated with the regular *-ĕt* and *gĕ+...+ĕt* affixes. It is irregular in that the /b/ of the stem becomes [t] in the 3rd person singular present and in the past, and disappears in the 2nd person singular present. Also, a special statement is required specifying that the stem vowel /ā/ is shortened in the past tense, and in the 2nd and 3rd person singular in the present tense. The only way in which this stem seems to be strong is in that the vowel umlauts in the past subjunctive. I believe, though, that it is easier to call this suppletion than to mark the stem [-Reg].

c. *kŏmmen* - *kām* - *gĕkŏmmĕn* - *kŏmmt* 'come'. The simplest way to handle this stem is to set up the underlying form /kĕm/ (cf. the similar treatment of *nēhmen* in fn. 30). A special statement specifying that the present tense vowel is $\begin{bmatrix}+\text{grv}\\+\text{flt}\end{bmatrix}$ will be necessary.

d. *laufen* - *lief* - *gelaufen* - *läuft* 'run'. The best way of treating this stem seems to be to set up the base form /lăf/ and marking it so that it must undergo (RR6c) (like *schlāfen*), which will cause the past tense vowel to be specified as [ī] by (13'''). Then a suppletive rule inserting /w/ in all forms except the past tense will be necessary.

e. *rūfen* - *rīef* - *gĕrūfĕn* - rūft 'call'. Setting up the base form /răf/, marked [-Prs Um] and making a statement that the suppletive vowel [ū] appears except in the past tense seems to be the simplest solution here. This way, /răf/ does not have to be marked specially so that (RR7) does not apply, although, as in the case of /lăf/, (RR6c) must be made obligatory.

f. stȫssen - stīess - gĕstō̈ssĕn - stȫsat 'bump'. This is probably also best treated in a similar way to laufen, i.e., the base form will be /štăs/, and (RR6c) must be made obligatory.

g. hauen - hīeb (or haute) - gehauen - haut 'hew'. As far as I know, this ø - [b] alternation is unique in German. Probably the best base form is /hāb/, marked to undergo (RR6c) obligatorily. The same statement of /w/ insertion that was used for laufen must be repeated, and the /b/ must be deleted everywhere except in the past tense and in nominalization (cf. Hīeb 'spank').

h. hēben - hūb (or hōb) - gĕhōbĕn - hēbt 'lift'
wērden - wŭrde (or wārd) - gewŏrden - wĭrd 'become'
The [ŭ] in the past tense can only be derived by special statement. The absence of -ĕt in wĭrd is predictable and will be discussed in §3.1 below. The absence of [d] in wĭrst requires a statement of suppletion, as does the presence of e in wŭrdĕ.

i. As mentioned in 1.8 above, the [ī] or [ĭ] in the 2nd and 3rd person singular of the verbs gĕbǟrĕn, schwǟrĕn and lö̆schĕn is suppletive. Also, the [ā] in the past tense of gĕbǟrĕn is suppletive.

j. The stem salzen 'salt' and spalten 'split' are totally regular except that they may optionally have a past participle in *gĕ+...+ĕn*. This must be marked somehow in the lexicon. *Verwirren* 'confuse' may have the irregular past participle *verworren* but it is otherwise regular. In the lexicon, it must be marked in such a way that it will be [-Reg, -Stem = PP] when in the presence of [+PP], but [+Reg] otherwise. Rules (18), $(4'')$, and (2^{iv}) will then apply to it.

k. As mentioned in §1.7, the vowels in the present tense of the modals must be treated as suppletive despite the partial similarities which these suppletive conjugations exhibit: non-umlauted vowels in 2nd person plural (except for *ihr mögt*) and [a] in the 2nd and 3rd persons singular for the 3 modals *dürfen*, *können*, and *mögen*.

l. I can only treat the [ay] of the 2nd and 3rd person singular of *wissen* 'know' as suppletive. Similarly the [ɔy] that appears in the conjugation of *dünken* 'seem' and in the obsolete 2nd and 3rd person singular of the verbs *fliegen* 'fly' (*er fleugt* and *fliehen* 'flee' (*er fleucht*) I must treat as suppletive, though I would hope that possibly some common explanation for all these diphthongal alternants might be found.

m. The vowel [ē] in the present tense of *gēhen* 'go' is suppletive, otherwise, if the base form of *gēhen* is /găng/, it exhibits the same *Ablaut* pattern as *făngen*. The length of the [ē] in *nēhmen* 'take' is suppletive (cf. fn. 30); and the shortening of the [ĭ] in *bĭtten* 'request' is also.

n. I treat the ts - s alternation in the conjugation of sĭtsen 'sit' as suppletive, but there are a few other instances of it in the language (cf. schwĭtzen 'sweat', Schweiss 'sweat'; Hĭtze 'heat', heiss 'hot').

o. The [ĭ] in the 2nd and 3rd persons singular of the present tense of trēten 'step' is suppletive. My rules would predict [ī]. (cf. § 3.1 below)

p. Finally, the verb tūn 'do' is suppletive in the past tense (tăt) and past participle (gĕtān).

3.1. In fn. 1 above, I mentioned a syncope rule which deletes unstressed [ĕ], providing no non-permissible clusters arise thereby. In most cases, for example an [ĕ] will not be syncopated between [d] and [t] or between [t] and [t]. That is /rēd + ĕt/ '(he) talks' will not syncopate to *[rēdt], and neither does /bĭt + ĕt/ '(he) requests' become *[bĭtt]. This means that the syncope rule would have to be formulated roughly as follows:

(28) Syncope

$$\begin{bmatrix} e \\ -\text{long} \\ -\text{stress} \end{bmatrix} \rightarrow \left\{ \begin{array}{ll} \text{a.} & [-\text{next rule}] \;/\; \begin{bmatrix} +\text{obs} \\ -\text{grv} \\ -\text{cnt} \end{bmatrix} \_\_\_ \begin{bmatrix} +\text{obs} \\ -\text{grv} \\ -\text{cnt} \end{bmatrix} \\ & \\ \text{b.} & \emptyset \;/\; \begin{bmatrix} \_\_\_ \\ +Z \end{bmatrix} \end{array} \right\}$$

The feature [+Z] is a convenient cover symbol for all the other restrictions on syncope which must som how be built-into (28). Some of these are mentioned informally in fn. 1, but since I have not studied the full range of restrictions on this rule, I will content myself with the statement in (28), for the other details about restrictions, though interesting, have no bearing on the problem I will now explore.

There are eleven stems in whose 3rd person singular form syncope occurs despite the fact that a [dt] or [tt] cluster results. These eleven are:

Type 4	*bĭrst* '(he) bursts', instead of **bĭrstĕt* *gĭlt* '(he) has value', instead of **gĭltĕt* *schĭlt* '(he) scolds', instead of **schĭltĕt* *wĭrd* '(he) becomes', instead of **wĭrdĕt*
Type 3a	*rǟt* '(he) advises', instead of **rǟtĕt* *brǟt* '(he) fries', instead of **brǟtĕt* *hä̆lt* '(he) holds', instead of **hä̆ltĕt*
Type 3b	*lǟdt* '(he) loads', instead of **lǟdĕt*
Type 5a	*fĭcht* '(he) fences', instead of **fĭchtĕt* *flĭcht* '(he) braids', instead of **flĭchtĕt*
Type 6a	*trĭtt* '(he) steps', instead of **trĭttĕt*

Inspection of the feature tree in § 2.2 reveals that these eleven stems are unique in sharing the abstract features [+Pres Um, -Inf Um]. This fact makes it possible to correctly predict this idiosyncratic syncope by formulating an exception to rule (28a) which mentions these features as a context.

But consideration of the 2nd person plural forms of these stems leads to the conclusion that they do not behave unusually with respect to syncope throughout their paradigms, but only in the 3rd person singular of the present. That is, we find the forms *lādet*, *wĕrdĕt*, *fĕchtĕt*, etc., instead of **lādt*, **wĕrdt*, and **fĕcht*. This means that (28) must be reformulated as follows:

(28') Syncope[46]

$$\begin{bmatrix}\text{V}\\ -\text{dff}\\ -\text{grv}\\ -\text{long}\\ -\text{stress}\end{bmatrix} \rightarrow \left\{\begin{array}{lll} \text{a.} & [-\text{next rule}] & / \begin{bmatrix}+\text{Prs Um}\\ -\text{Inf Um}\\ +\text{3rd}\\ +\text{sing}\end{bmatrix} + \underline{\quad} \\ \text{b.} & [-\text{next rule}] & / \begin{bmatrix}+\text{obs}\\ -\text{grv}\\ -\text{cnt}\end{bmatrix} \underline{\quad} \begin{bmatrix}+\text{obs}\\ -\text{grv}\\ -\text{cnt}\end{bmatrix} \\ \text{c.} & \emptyset & / \begin{bmatrix}\underline{\quad}\\ +\text{Z}\end{bmatrix} \end{array}\right\}$$

3.2 To summarize: there are many similarities in the paradigms of the approximately 200 strong verb stems in German. I have tried to capture these regularities by setting up a small set of abstract morphological features[47], which can, by and large, be assigned to strong stems on the basis of their underlying forms by a small set of redundancy rules. In addition, I have proposed a small set of phonological rules which take the specifications of these abstract features into account in changing various segmental features of the vocalic nuclei of these strong verb stems. As a measure of the success of this approach, I estimate that the redundancy rules in § 2 correctly predict between 80 % and 90 % of the feature specifications which the ordered phonological rules of the Appendix refer to in accounting for the variety of Ablaut patterns in standard German.

Appendix: Ordered Rules

I. Redundancy Rules for Morphological Features

Section where rule was last discussed

(RR1) $[+\text{verb}] \rightarrow \begin{bmatrix} +\text{Reg} \\ +\text{Stem} = \text{PP} \\ +\text{Pst} = \text{PP} \\ -\text{Prs Um} \\ -\text{Inf Um} \\ +\text{t Pres} \\ -\text{DM} \end{bmatrix}$ 2.0

DICTIONARY LOOKUP 2.0

(RR2) $[\alpha\,\text{Reg}] \rightarrow [\alpha\,\text{et}]$ 2.0

(RR3) $[+\text{Modal}] \rightarrow \begin{bmatrix} -\text{Reg} \\ -\text{t Pres} \end{bmatrix}$ 1.7

(RR4) Redundancy Rules for Stems in i

$$\begin{bmatrix} +\text{voc} \\ -\text{cns} \\ -\text{grv} \\ +\text{dff} \\ -\text{Reg} \end{bmatrix} \rightarrow \left\{ \begin{array}{ll} \text{a.} & [-\text{Stem} = \text{PP}] \\ \text{b.} & [-\text{Pst} = \text{PP}] \; / \; \underline{\quad\quad}[+\text{nsl}] \end{array} \right\}$$

1.21

$$\begin{bmatrix} +\text{voc} \\ -\text{cns} \\ -\text{Reg} \end{bmatrix}$$

(RR5) Redundancy Rule for Stems in e

$$\begin{bmatrix} -\text{grv} \\ -\text{dff} \end{bmatrix} \rightarrow \left\{ \begin{array}{ll} \text{a.} & [+\text{Prs Um}] \\ \text{b.} & \begin{bmatrix} -\text{Stem} = \text{PP} \\ -\text{Pst} = \text{PP} \\ -\text{next rule} \end{bmatrix} \; / \; \left\{ \begin{array}{l} \underline{\quad\quad}\begin{bmatrix} +\text{cns} \\ +\text{voc} \end{bmatrix} C_1 \\ \underline{\quad\quad}\begin{bmatrix} +\text{obs} \\ +\text{grv} \\ -\text{voi} \end{bmatrix} \end{array} \right\} \\ \text{c.} & [\alpha\text{Pst} = \text{PP}] \; / \; \begin{bmatrix} \overline{\quad\quad\quad} \\ -\alpha\text{Stem} = \text{PP} \end{bmatrix} \\ \text{d.} & \begin{bmatrix} +\text{et} \\ -\text{Prs Um} \\ -\text{Stem} = \text{PP} \\ +\text{Pst} = \text{PP} \end{bmatrix} \; / \; \underline{\quad\quad}[+\text{nsl}] \end{array} \right\}$$

1.6

(RR6) Redundancy Rule for Stems in a

$$[+\text{cmp}] \rightarrow \begin{array}{l} \text{a.} \\ \text{b.} \\ \text{c.} \end{array} \left\{ \begin{array}{lll} \begin{bmatrix} \alpha\text{Stem} = \text{PP} \\ -\alpha\text{Pst} = \text{PP} \\ \alpha\text{Prs Um} \end{bmatrix} & / & \underline{\quad}\,[\alpha\text{cns}] \\ [+\text{flt}] & / & \underline{\quad}\ [+\text{cns}] \\ \begin{bmatrix} -\text{flt} \\ -\text{grv} \end{bmatrix} & / & \underline{\quad}\ \begin{bmatrix} +\text{cns} \\ -\text{grv} \\ +\text{dff} \\ \alpha\text{cnt} \\ \alpha\text{str} \end{bmatrix} \end{array} \right\} \Bigg/ \begin{bmatrix} +\text{voc} \\ -\text{cns} \\ -\text{Reg} \end{bmatrix} \qquad 2.0$$

(RR7) Redundancy Rule for Stems in $\{\underline{o}, \underline{u}\}$

$$\begin{bmatrix} +\text{grv} \\ -\text{cmp} \end{bmatrix} \rightarrow \left\{ \begin{array}{l} [-\text{next rule}] \ / \ \underline{\quad}\ \begin{bmatrix} +\text{voc} \\ -\text{cnt} \end{bmatrix} \\ \\ [+\text{Inf Um}] \end{array} \right\} \qquad 1.8$$

II. Inflectional Rules

(17) et Suffixation

$$\emptyset \rightarrow \breve{e}\text{t} \ / \ \begin{bmatrix} +\text{et} \\ \left\{ \begin{array}{l} +\text{Pst} \\ +\text{PP} \end{array} \right\} \end{bmatrix}_{\text{Stem}} + \underline{\quad} \qquad 1.6$$

(18) Past Participle Inflection

$$\emptyset \rightarrow \left\{ \begin{array}{l} \text{g}\breve{e} \ / \ \underline{\quad} + [_{\text{Stem}} \\ \\ \breve{e}\text{n} \ / \ [-\text{et}]\ ]_{\text{Stem}} + \underline{\quad} \end{array} \right\} \Big/ \overline{[+\text{PP}]} \qquad 1.6$$

(23) 1st - 3rd Person Inflection

1.7

$$\emptyset \rightarrow \left\{ \begin{matrix} [-\text{next rule}] \;/\; \left[\begin{matrix} \overline{} \\ +\text{Sing} \\ \left\{\begin{matrix} \begin{bmatrix} -\text{t Pres} \\ +\text{Pres} \end{bmatrix} \\ \begin{bmatrix} -\text{et} \\ +\text{Pst} \end{bmatrix} \end{matrix}\right\} \end{matrix}\right] \\ \\ {}_{1}\left\{\begin{matrix} \check{e} \\ \\ \check{e}\text{n} \end{matrix}\right\}_{1} \;/\;]_{\text{Stem}} + (\check{e}\text{t}) + \underline{} \end{matrix} \right\} \;/\; \left[\begin{matrix} \overline{+\text{1st}} \\ +\text{3rd} \\ {}_{1}\left\{\begin{matrix} +\text{sing} \\ -\text{sing} \end{matrix}\right\}_{1} \end{matrix}\right]$$

(24) t Present

$$\emptyset \rightarrow \text{t} \;/\;]_{\text{Stem}} + (\check{e}\text{t}) + \check{e} \left[\begin{matrix} \overline{} \\ +\text{Pres} \\ +\text{sing} \\ +\text{3rd} \\ +\text{Indic} \\ +\text{t Pres} \end{matrix}\right]$$

1.7

(25) 2nd Person Inflection

$$\emptyset \rightarrow \check{e}\; {}_{1}\left\{\begin{matrix} \text{s} \\ \emptyset \end{matrix}\right\}_{1} \text{t} \;/\;]_{\text{Stem}} + (\check{e}\text{t}) + \left[\begin{matrix} \overline{} \\ +\text{2nd} \\ {}_{1}\left\{\begin{matrix} +\text{sing} \\ -\text{sing} \end{matrix}\right\}_{1} \end{matrix}\right]$$

1.7

III. Vowel Alternation Rules

(4") Backing

$$\begin{bmatrix}+\text{voc}\\-\text{cns}\\-\text{Reg}\end{bmatrix} \rightarrow \begin{bmatrix}+\text{grv}\\+\text{flt}\end{bmatrix} \ / \ \begin{bmatrix}\underline{\qquad\qquad\qquad}\\-\text{Stem} = \text{PP}\\ \left\{\begin{matrix}+\text{PP}\\+\text{Nominal}\\ \begin{bmatrix}+\text{Pst} = \text{PP}\\+\text{Pst}\end{bmatrix}\end{matrix}\right\}\end{bmatrix} \qquad 1.21$$

(13"') Past Tense I

$$\begin{bmatrix}+\text{voc}\\-\text{cns}\\-\text{Reg}\\\alpha\text{cmp}\\\beta\text{dff}\end{bmatrix} \rightarrow \left\{\begin{matrix}\begin{bmatrix}-\alpha\text{cmp}\\-\beta\text{dff}\end{bmatrix} \ / \ \left\{\begin{matrix}\begin{bmatrix}\underline{\qquad\qquad}\\+\text{Pst}\\-\text{Pst} = \text{PP}\end{bmatrix}\\ \begin{bmatrix}\underline{\qquad\qquad}\\+\text{et}\\-\text{Stem} = \text{PP}\\ \left\{\begin{matrix}+\text{Pst}\\+\text{PP}\end{matrix}\right\}\end{bmatrix}\end{matrix}\right\}\\ [+\text{long}] \ / \ \begin{bmatrix}\underline{\qquad\qquad}\\-\text{Pst} = \text{PP}\\+\text{Prs Um}\\+\text{Pst}\end{bmatrix}\end{matrix}\right\} \qquad 1.6$$

(12) Past Tense II

$$\begin{array}{ccccc}\begin{bmatrix}+\text{voc}\\-\text{cns}\\-\text{Reg}\\ \left\{\begin{matrix}+\text{Pst}\\+\text{PP}\end{matrix}\right\}\end{bmatrix} & - & \begin{bmatrix}-\text{voc}\\-\text{cns}\end{bmatrix} & & \\ 1 & - & 2 & \rightarrow & \emptyset - \begin{bmatrix}+\text{voc}\\+\text{long}\\2\end{bmatrix}\end{array} \qquad 1.511$$

(2^{iv}) Lowering

$$\begin{bmatrix}+\text{voc}\\-\text{cns}\\-\text{Reg}\\-\text{et}\\+\text{grv}\end{bmatrix} \rightarrow \left\{\begin{matrix}[-\text{next rule}] \ / \left\{\begin{matrix}\underline{\qquad}[+\text{nsl}]C_1\\ \begin{bmatrix}\underline{\qquad\qquad}\\+\text{Stem} = \text{PP}\\-\text{Inf Um}\end{bmatrix}\end{matrix}\right\}\\ \begin{bmatrix}-\text{dff}\\-\text{cmp}\end{bmatrix} \ / \ \begin{bmatrix}\overline{-\text{Stem}} = \text{PP}\\ \left\{\begin{matrix}+\text{PP}\\ \begin{bmatrix}+\text{Pst} = \text{PP}\\+\text{Pst}\end{bmatrix}\end{matrix}\right\}\end{bmatrix}\end{matrix}\right\} \qquad 1.8$$

(14) Compact Vowel Adjustment

$$\begin{bmatrix}+\text{voc}\\-\text{cns}\\+\text{cmp}\end{bmatrix} \rightarrow \left\{\begin{matrix}[-\text{next rule}] / \underline{\qquad} [-\text{cns}]\\ \begin{bmatrix}+\text{grv}\\-\text{dff}\\-\text{flt}\end{bmatrix}\end{matrix}\right\} \qquad 1.512$$

(9") *Umlaut* 1.41

$$\begin{bmatrix} +\text{voc} \\ -\text{cns} \\ \left\langle \begin{matrix} -\text{cmp} \\ -\text{flt} \end{matrix} \right\rangle_a \end{bmatrix} \rightarrow \begin{bmatrix} -\text{grv} \\ \langle +\text{dff} \rangle_b \end{bmatrix} \Big/ \quad \Big[_{\text{Stem}}\, X \begin{bmatrix} \overline{\quad\quad} \\ +\text{stress} \end{bmatrix} \left(C_o \begin{bmatrix} +\text{voc} \\ -\text{cns} \\ -\text{stress} \end{bmatrix} C_{oo} \right)' \Big]_{\text{Stem}} \Big/ \left\{ \begin{matrix} \left[\overline{+\text{Umlaut}} \right] \\ \begin{bmatrix} \overline{\quad\quad} \\ +\text{Pst} \\ -\text{Reg} \\ -\text{Indic} \end{bmatrix} \\ \left\langle \left\{ \begin{matrix} \text{ge+}\_\_\text{+(e)} \\ \begin{bmatrix} \overline{\quad\quad} \\ +\text{Prs Um} \\ +\text{Pres} \\ -\text{1st} \\ +\text{sing} \end{bmatrix} \\ \begin{bmatrix} \overline{\quad\quad} \\ +\text{Inf Um} \\ \left\{ \begin{matrix} +\text{Pres} \\ +\text{Inf} \end{matrix} \right\} \end{bmatrix} \end{matrix} \right\} \right\rangle_c \end{matrix} \right\}$$

Condition: if *a* and *c*, then *b*.

(10) *Special Past Subjunctive*

$$\begin{bmatrix} +\text{voc} \\ -\text{cns} \\ -\text{Reg} \\ -\text{Stem = PP} \\ -\text{Pst = PP} \\ +\text{Prs Um} \\ +\text{Pst} \\ -\text{Indic} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{cmp} \\ \alpha\text{dff} \end{bmatrix} \Big/ \quad \rule{2em}{0.4pt} \begin{bmatrix} +\text{voc} \\ \alpha\text{cnt} \end{bmatrix}$$ 1.43

Shortening

$$\begin{bmatrix} +\text{voc} \\ -\text{cns} \end{bmatrix} \rightarrow \left\{ \begin{matrix} [-\text{next rule}] \Big/ \begin{bmatrix} \overline{\quad\quad} \\ -\text{dff} \\ -\text{flt} \end{bmatrix} \begin{bmatrix} +\text{voc} \\ +\text{cnt} \end{bmatrix} \begin{bmatrix} +\text{obs} \\ -\text{grv} \end{bmatrix} \\ [-\text{long}] \Big/ \left\{ \begin{matrix} \rule{2em}{0.4pt} \begin{bmatrix} -\text{obs} \\ +\text{cns} \end{bmatrix} C_1 \\ \begin{bmatrix} \overline{\quad\quad} \\ -\text{Reg} \\ -\text{Stem = PP} \\ +\text{Pst = PP} \\ \left\{ \begin{matrix} +\text{PP} \\ +\text{Pst} \\ +\text{Nominal} \end{matrix} \right\} \end{bmatrix} [-\text{voi}] \end{matrix} \right\} \end{matrix} \right\}$$ 1.513 and 1.52

Dental Mutation

$$\begin{bmatrix} +\text{obs} \\ -\text{cnt} \\ -\text{grv} \\ +\text{dff} \end{bmatrix} \rightarrow [+\text{voi}] \Big/ \left[\overline{\left\{ \begin{matrix} +\text{Pres} \\ +\text{inf} \end{matrix} \right\}} \right]$$ 1.52

(28') **Syncope**

$$\begin{bmatrix}+\text{voc}\\-\text{cns}\\-\text{grv}\\-\text{dff}\\-\text{cmp}\\-\text{long}\\-\text{stress}\end{bmatrix} \rightarrow \left\{\begin{array}{lll} [-\text{next rule}] & / & \begin{bmatrix}+\text{Prs Um}\\-\text{Inf Um}\\+\text{3rd}\\+\text{sing}\end{bmatrix} + \underline{\quad} \\ [-\text{next rule}] & / & \begin{bmatrix}+\text{obs}\\-\text{grv}\\-\text{cnt}\end{bmatrix} \underline{\quad} \begin{bmatrix}+\text{obs}\\-\text{grv}\\-\text{cnt}\end{bmatrix} \\ \emptyset & / & \begin{bmatrix}\underline{\quad}\\+\text{Z}\end{bmatrix} \end{array}\right\} 3.1$$

FOOTNOTES

[*] The research for this work was done while I was a Summer Associate at the Systems Development Corporation, for whose support I am grateful. I would like to thank Morris Halle, Bruce Fraser, and Manfred Bierwisch for reading an earlier draft of this paper, and particularly Wayles Browne and Paul Kiparsky for their many valuable criticisms and suggestions.

1.
There are many problems connected with syncope to which I do not know the answers. For instance, while the final /ĕ/ in /hăndĕl+ĕn/ and /hămĕr+ĕn/ is dropped to yield [hăndə̆ln] 'deal with' and [hămə̆rn] 'hammer', it is the penultimate /ĕ/ which is elided in /rēgĕn+ĕn/ and /ātĕm+ĕn/ to produce [rēgnə̆n] 'rain' and [ātmə̆n] 'breathe', so it is clear that the preceding segment (at least) influences the rule. Also, since /hăndĕl+ĕ/ becomes [hăndlə̆] 'I deal with', while /hăndĕl+ĕn/ becomes [hăndə̆ln] 'deal with', as was noted above, it is clear that the following segments influence the rule. But why should /bĕ+gĕ+nū̆g+ĕn/ lose its second /ĕ/ to become [bə̆gnū̆gŋ] 'satisfy', when /gĕ+nū̆g+ĕn/ keeps its first /ĕ/ and remains [gə̆nū̆gŋ] 'suffice'? I have not been able to formulate a rule which takes account of all the relevant facts and must therefore leave the problems to be solved by future research.

2.
A rule of Vowel Reduction will convert any non-word-initial unstressed *e* which remains after syncope to [ə̆]. Thus *arbeitetet* 'you (pl.) worked' will eventually be realized as [ārbăytə̆tə̆t],

while *entlang* 'along' will not become *[ăntlăng] but will remain [ɛ̆ntlăng].

3. These terms were first used by Jakob Grimm in the 2nd edition of his *Deutsche Grammatik*, 1822. Arnold M. Zwicky has recently studied *Umlaut* phenomena intensively (cf. his "Umlaut in German" (unpublished MIT mimeograph, 1964), and "Umlaut and Noun Plurals in German, which appears elsewhere in this volume. Zwicky demonstrates that *Umlaut* phenomena in Modern German can be handled effectively by making use of abstract morphological features and various rules interrelating them. Although it was the case in early Germanic that umlauting was phonologically conditioned, so many sound changes have taken place since then that it appears that in Modern German, umlauting can no longer be phonologically predicted, but must instead be made to depend on the presence of the feature [+Umlaut]. My work is based on Zwicky's findings, although I will occasionally propose minor additions to his rules for *Umlaut* phenomena.

4. Cf. Noam Chomsky, *Syntactic Structures*, Mouton 1957 and especially *Aspects of the Theory of Syntax*, MIT Press, 1965.

5. Cf. Morris Halle, "Phonology in Generative Grammar" and "Bases of Phonology" in *The Structure of Language: Readings in the Philosophy of Language*, edited by Fodor and Katz, Prentice-Hall, 1964.

For empirical studies making use of this theory cf.

Halle, M., The Sound Pattern of Russian, Mouton 1959 and Chomsky, N. The Sound Pattern of English (in preparation)

McCawley, James, Japanese Accentology, unpublished MIT doctoral dissertation, 1964.

Foley, James, Spanish Morphology unpublished MIT doctoral dissertation, 1965

__________, "Prosthesis in the verb sum", Language 44, pp. 59-64, 1965.

Lightner, Theodore M., Segmental Phonology of Modern Standard Russian, unpublished MIT doctoral dissertation, 1965.

Shane, Sanford A., The Phonological and Morphological Structure of French, unpublished MIT doctoral dissertation, 1965.

Kuroda, Sige-Yuki, Yawelmani Morphophonemics (to appear).

Zwicky, Arnold M. Sanskrit Phonology, unpublished MIT doctoral dissertation, 1965.

Postal, Paul M., Mohawk Phonology (in preparation).

Kiparsky, R.P.V., Linguistic Change, unpublished MIT doctoral dissertation, 1965.

______________, Uber den Deutschen Akzent, in Studia Grammatica 1966.

Matthews, G.H., Hidatsa Syntax, Mouton and Co., 1965, cf. especially the appendix on phonology.

6. Cf. Aspects, especially Ch. 2, § 2.3 and Ch. 4, § 2.

7. I will follow the traditional practice of listing the four "principal parts" of each ablauting stem, in this order: infinitive, 1st person singular past tense, past participle, 3rd person singular present tense. Given these four parts, one can easily derive all the verbal forms of all non-suppletive irregular verbs by well-known rules which I will not state here. I will cite all forms in traditional orthography except that I will at times use the symbols '-' and '◡' to indicate long and short vowels, respectively.

8. The notation X_i^j means "At least *i* and at most *j* X's". Thus C_1^1 means "Exactly one consonant and V_1 means "At least one vowel". The following abbreviations are also used:

$$V = \begin{bmatrix} +\text{voc} \\ -\text{cns} \end{bmatrix}_1^1 \qquad C = C_0^1 = \left[\begin{Bmatrix} +\text{cns} \\ -\text{voc} \end{Bmatrix}\right]_0^1$$

It would go beyond the scope of this paper to present all the evidence for deriving [ŋ] from /ng/. Essentially the arguments have to do with sequential constraints of underlying segments. That is, if we were to treat [ŋ] as a single phoneme, parallel to [m] and [n], we would come across the following difficulties:

1. While there are initial [šm] and [šn] clusters (*schmatzen* 'smack lips', *Schnee* 'snow') there is no initial [šŋ] cluster.
2. While there are long and short vowels and diphthongs before word-final [m] and [n], there are only short vowels before [ŋ]:

stŭmm 'mute', Reichtūm 'wealth', kaum 'hardly'
Reim 'rhyme'
Kĭnn 'chin', schīen 'seemed', braun 'brown' Schein 'bank-note'.
fĭng 'caught' *fīeng, *braung, *scheing

Furthermore, it is precisely before morpheme-internal clusters which contain one or more non-grave segments that long vowels and diphthongs are excluded. That is, the following words occur:

Faust 'fist', Bīest 'beast', Kauz 'screech-owl', hīelt 'held'

but the following are impossible within a morpheme
*bīnk, *dēft, *daulf, etc.

For a more complete argument for treating [ŋ] as /ng/ in English, cf. Halle and Chomsky The Sound Pattern of English. Many of the arguments presented there are also valid for German.

9. Schinden and (obs.) schrinden will have to be designated in such a way that the rule specifying that all verbs in ĭ [+nsl] C_1^1 have a past tense in [ă] does not apply to them. The same will apply to glimmen 'glimmer' and klimmen 'climb' in Type 1b.

10. I will temporarily assume that stems are marked as to what vowels appear in them in their last three principal parts by such features as are on the right side of the arrow in (1). That this is an overspecification will be seen below (cf. § 1.21). The feature [+PP] is a complex symbol denoting "Past Participle". (cf. fn. 13)

The plus sign, "+", denotes morpheme boundary.

11. I have prefixed nouns like *Bug* with a question mark to indicate that these nouns are probably unrelated to the verb in question. For a stimulating discussion of problems in ascertaining to what degree morphemes are related, cf. Shane, Ch. 1, op. cit. fn. 5.

12. The intransitive verb *līegen*, *lāg*, *gelēgen*, *līegt* "lie". But it will be shown below that this is only an apparent counter-example, and that the base form for *liegen* should not be /līg/ but rather /lēg/. Cf. §§ 1.4, 1.61.

13. I am assuming that past participle is marked as a feature of the verb ([+PP]) by the syntactic rules for the auxiliary. Nothing depends on this assumption, however: if it is found to be easier to introduce a past participle morpheme next to stems, and thus to derive *gefunden* from

$$(\text{find})_{\text{Stem}} + \text{PP}$$

all that will be required is a trivial change in rules like (4). Cf. Chomsky, *Aspects*, p. 170-176.

14. As I have not studied deverbal nouns in detail, I do not know if such exceptions to (4') as *Frŏst*, *Angebōt*, *Bŏgen*, *Schlŏss* and *Sprŏss* have any non-*ad hoc* explanation or not.

15.
The notation '[-next rule]' is a way of expressing negative environments. For example, suppose there were a rule of some language whereby intervocalic consonants were voiced except after the vowel a. This would be symbolized in the following way:

$$C \rightarrow \left.\begin{matrix}[-\text{next rule}] & / \ a \\ [+\text{voi}] & / \ V\_\_V\end{matrix}\right\}$$

By this convention, (2') merely states that all u's in past participles are lowered to o except those followed by a nasal cluster. (At this point in the derivation, [ŋ] is still represented by the cluster /ng/ - cf. fn. 8.) For a more careful description of this notation, cf. Halle and Chomsky, op. cit.

16.
A problem arises in the case of the verb sīeden 'boil'. Notice that there is a voiced - voiceless consonant alternation in the principal parts of this verb, which is not the case with any other verbs of Type 2. I propose setting up a stem /zit/ for this verb and adding a special rule voicing the /t/ in the infinitive and present tense. This rule will also be used to derive schneiden 'cut' and leiden 'suffer' (cf. § 1.52 below).

17.
With one exception - the verb bīeten 'offer'. My rule would predict the past tense form *bott [bŏt]. This is a real exception to the shortening rule and must be marked as such in the lexicon.

18.
Actually, it will be necessary to break (5) up into two parts a and b because of the existence of the verb schaffen 'create'.

The principal parts of this verb are schăffen, schūf, geschăffen, schăfft. Where the other stems of Type 3b umlaut in the present, schăffen does not, and it will therefore be necessary to mark it as not undergoing rule (5b)

$$(5)\quad \begin{bmatrix} \text{V} \\ +\text{cmp} \\ -\text{Reg} \end{bmatrix} \rightarrow \begin{array}{l} \text{a.} \\ \\ \text{b.} \end{array} \begin{Bmatrix} \begin{bmatrix} +\text{Stem} = \text{PP} \\ -\text{Pst} = \text{PP} \end{bmatrix} \\ \\ [+\text{Prs Um}] \end{Bmatrix}$$

19. For a more detailed explanation of the α-convention cf. Halle and Chomsky, The Sound Pattern of English.

20. In addition to these 19, there is one verb, which, in addition to a regular, weak conjugation, has two obsolete strong conjugations: pflēgan 'do habitually'

pflēgen, (obs) pflāg or (obs) pflōg, gepflōgen, pflēgt

If the form pflāg is desired, the stem must be classified as being of Type 4, exceptional in that it is [-Prs Um]. If it is assigned the past tense pflōg, it is of Type 5b. Either way, the rules I will set up could handle it, so I will not comment on it further.

21. This verb can be [± Prs Um]: er schīert or er schērt 'he shears'. If the present is schīert, the stem is of Type 5a, otherwise it is of Type 5b.

22. This stem has an irregular shortening of its present tense vowel in the 2nd and 3rd person singular. Where we would expect *gi͞ebst* and *gi͞ebt*, the forms are instead *gĭbst* and *gĭbt* in the standard dialect. As far as I can see this is another true irregularity, and some special rule must be set up for it. This also holds true for the verb *trēten* 'step'.

23. *Genēsen* is irregular in that it is [-Prs Um]. This feature must be marked in the lexicon.

24. This verb has a suppletive [g] in its past participle (*gegessen*).

25. All Type 6c verbs have idiosyncrasies: instead of *bĭttet* 'he requests', with a short [ĭ], one would expect **bi͞etet*; *sĭtzen* exhibits a ts ~ s consonant alternation; and finally, these 3 stems must undergo a rule raising their underlying vowel to an [ī] or [ĭ].

26. Cf. references in fn. 3.

27. Later rules will raise the vowel here to [ɛ̆]: in standard German, [ĕ] and [ɛ̆] merge. Cf. Zwicky, "Noun Plurals", fn. 3.

28. There are two notational conventions in (9") which require

explanation. The use of multiple slash marks permits the compounding of complex environments. For example, 28A can be alternatively formulated as 28A':

28A. $X \rightarrow Y \,/\, \begin{bmatrix} \text{---} \\ +A \\ +B \end{bmatrix}$

28A'. $X \rightarrow Y \,/\, \begin{bmatrix} \text{---} \\ +A \end{bmatrix} \,/\, \begin{bmatrix} \text{---} \\ +B \end{bmatrix}$

28A' could be read in English as follows: "rewrite X as Y when X has the feature [+A] and when it also has the feature [+B]."

By convention, rules like 28B can be alternatively formulated as either 28B' or 28B" or 28B'''.

28B. X → Y / ABC —— DEF

28B'. X → Y / C —— D / AB —— EF

28B". X → Y / BC —— DE / A —— F

28B'''. X → Y / C —— D / B —— E / A —— F

28B''' could be read in English as follows: "rewrite X as Y if X is preceded by C and followed by D, and if C is preceded by B and D followed by E, and if B is preceded by A and E followed by F."

In these simple cases, there is no point in reformulating 28A as 28A' or 28B as 28B', 28B", or 28B''', but there are cases in which the partial similarity of adjacent rules could not be expressed without the above conventions for multiple slashes. For example, consider the two rules in 28C.

28Ca. X → Y / AB —— CD

b. $X \rightarrow Y \,/\, B \begin{bmatrix} \text{---} \\ +E \end{bmatrix} C$

Using multiple slashes, these two rules can be collapsed into 28C'

28C'. $$X \rightarrow Y \; / \; B \underline{\quad} C \; / \left\{ \begin{matrix} A \underline{\quad} D \\ \left[\begin{matrix} \underline{\quad} \\ +E \end{matrix} \right] \end{matrix} \right\}$$

28C' reflects formally a fact which is unexpressed in 28Ca and 28Cb: these two rules are partially similar in environment in a linguistically significant way - X is rewritten as Y in both cases only if it is preceded by B and followed by C.

Notice that the double slash convention would not allow the two rules in 28D to be collapsed:

28D a. $X \rightarrow Y \; / \; AB \underline{\quad} DC$

b. $X \rightarrow Y \; / \; B \left[\begin{matrix} \underline{\quad} \\ +E \end{matrix} \right] C$

The double slash convention is needed in the Umlaut rule, (9"), because it is necessary to be able to say that the umlauted vowel is always the last stressed vowel of a stem, whether the umlauting is caused by the feature [+Umlaut], or by the fact that the stem has the feature [+Prs Um] and is an irregular verb in the 2nd or 3rd person singular, or by the fact that the stem occurs inside a neuter noun like Gebirge.

It is a relatively new discovery that it is necessary to be able to state truth-functional conditions between subparts of rules, as has been done in (9"). But Yuki Kuroda has recently pointed out that the α-notation, which was explained above in connection with rule (7'), is really only an abbreviatory device for rules with if-and-only-if conditions. For instance, rule (7") above is logically equivalent to 28E.

28E. $$[+\text{obs}] \rightarrow {}_a\langle +\text{voi} \rangle_a \; / \; \underline{\quad} \left[\begin{matrix} +\text{obs} \\ {}_b\langle +\text{voi} \rangle_b \end{matrix} \right]$$

Condition: a if and only if b.

And since assimilation and dissimilation phenomena, which are known to every phonologist, are logically equivalent to truth-functional connections between parts of rules, it should come as no surprise that other truth-functional relations besides bi-equivalence may obtain between parts of rules.

In Halle and Chomsky, *op. cit.*, a detailed explanation is given of the relationship that obtains between notational conventions and a theory of linguistically significant generalizations.

To summarize, rule (9"), *Umlaut*, says the following: "The last stressed vowel of a stem is fronted if it has the feature [+Umlaut], if it occurs in a stem which is in a word like *Gebirge*, or if it occurs in the stem of a verb which has the feature [+Prs Um and if this verb is in the 1st or 2nd person singular. Furthermore, if that vowel is non-compact and non-flat (i.e., if it is [e] or [i]), and if it occurs in either of the last two environments stated in the preceding sentence, it becomes diffuse (i.e., it is converted to [i])."

It should be emphasized that rule (9") would have to be formulated with double slash marks and an *if-then* condition in any event, so that it would account for alternations like *Hūt* 'hat' - *Hǖter* 'hats' as well as for alternations like *Bĕrg* - *Gebĭrge*. Handling alternations like *sēhen* 'see' - *sīeht* 'he sees' with the same rule only adds minimally to its complexity.

27.

Possibly (9") should be broadened so that it could apply to verbs of Type 6a when followed by a nominalizing suffix beginning with /t/. The following word pairs are clearly related

sehen 'see'	Sicht 'sight'
geschehen 'happen'	Geschichte 'history, story'
treten 'step'	Tritt 'step'

and possibly geben 'give' should be phonologically related to Gift 'poison' (but cf. also Mitgift 'dowry'). To investigate this question would go beyond the bounds of this paper, however.

30. The verb nēhmen 'take' poses a problem here. Its principal parts are these (note alternations in vowel length):

nēhmen, nāhm, genŏmmen, nimmt

In no other Type 4 stem is the vowel in the infinitive long, while the vowel of the past participle and 3rd person singular is short. It seems to me that the best solution here is to consider the vowel in the base form short (/nĕm/) and to have a special statement of allomorphy for the infinitive and present tense plural. This will entail that nēhmen be marked as an exception to the last part of rule (8^{iv}) (cf. § 1.6 below), which states that all stems of the form /ĕ[+nasal]C/ are of Type 3.

31. And in most of their corresponding nouns. Cf. Biss 'bite', Griff 'grasp', Kniff 'pinch', Pfiff 'whistle', Riss 'tear', Ritt 'ride', Schiss 'shit', Schliff 'polish', Schmiss (cf.

Rausschmiss 'throwing away'), *Schnitt* 'cut', *Schritt* 'step', *Strich* 'stripe', *Suff* 'boozing'.

There are 5 nouns of Type 7b which irregularly exhibit [ay]: *Fleiss* 'industriousness', -*gleich* (cf. *Vergleich* 'comparison'), *Leid* 'sorrow', -*schleiss* (cf. *Verschleiss* 'consumption'), and *Streit* 'quarrel'. No nouns formed from stems of Types 7a or 7c exhibit short vowels except *Schrift* 'writing' (but cf. *Schrieb* "piece of written material").

This suggests that the rule given below (cf. § 1.52), which shortens the vowel in the past tense and past participle of stems of Types 2b (like *fliēssen* 'flow', *flŏss*, *geflŏssen*), 7b, and 7d, be also made to apply to deverbal nouns from stems of Type 2b (like *Fluss* 'river'), and 7b. But since the primary concern of this paper is with verb morphology, I have not made explicit provision in rule (16) for deverbal nouns.

32. The term "polarity" originated with Meinhoff (cf. his *Die Sprache der Hamiten*), who discovered such switching rules in an African language called Fulani. For an interesting case of a switching rule in English, cf. Halle and Chomsky's discussion of the Vowel Shift rule in *The Sound Pattern of English*.

33. Cf. § 1.3 above for an explanation of the α-notation.

34. The feature [±DM] will be marked negatively for all stems except *schneiden*, *leiden* and *sieden*.

35. The past tense and past particle of this verb are *dăchte* and *gedăcht* respectively. This k ~ x alternation probably cannot be handled without solving the problem of other velar alternations like those mentioned in § 0.2 in connection with /ɣ/, a problem which I will not attempt to deal with in this paper.

36. And, of course, the idiosyncratic length alternation in *bǐtten* - *bāt* - *gebēten* and the ts-s alternation in *sǐtzen* - *sāss*.

37. For instance, consider the following sentences:

Er wollte gehen. 'He wanted to go.'
**Er wünschte gehen.* ('He wished to go.')
Er hat gehen wollen. 'He wanted to go.'
**Er hat gehen wünschen.* ('He wished to go.')

I propose to account for these facts by assigning verbs like *wünschen* the feature [-Modal], and the six verbs like *wollen* [+Modal].

38. The verb *gebǟren*, *gebār*, *gebōren*, *gebīert* 'give birth to' is unique in having an a-a-o-i *Ablaut* pattern, and I can only treat it as suppletive.

39. In the form gĕ+gĕ+nŏs+ĕn, the first *ge* will be deleted by a rule proposed by Kiparsky in his "Über den Deutschen Akzent" *op. cit.* fn. 3.

40.

Rule (6') (cf. § 1.512) is actually a redundancy rule, but I have to make explicit use of it in the derivations of *fi̅e̅lst* 'you fell' and *būkst* 'you baked'. Actually, of course, throughout these derivations I implicitly assume the presence or absence of such features as [±et, ±Stem = PP, ±Pst = PP, etc.] which have been added to the base form by some redundancy rule or other.

41.

Rule (9"), *Umlaut*, does not apply to *hēben* because it, like all other verbs of Type 5b, must be entered in the lexicon with the marking [-Prs Um]. Cf. § 1.4

42.

Rule (2^{iv}) - cf. § 1.8 - does not apply to verbs of Type 7a and 7b like blīb+ěst, even though they are specified [-Stem = PP, +Pst = PP, +Pst] because the vowel in them is not [+grv], as is required on the left of the arrow. It is precisely for this reason that this [+grv] must be included in rule (2^{iv}): otherwise, (2^{iv}) would derive the incorrect *[blēbst].

43.

A word of explanation about the collapsing of rules (11) and (5) may be in order here. The environment in (5) is —— $\begin{bmatrix}-\text{cns}\\-\text{voc}\end{bmatrix}$, but since there are no vowel sequences in strong verbs, this environment can be generalized to ——[-cns] without producing wrong results.

44.

To go into how this is effected formally would go beyond the scope of this paper. In Halle and Chomsky, *The Sound Pattern of*

English, a detailed account is given of a theory of markedness. in which such rules as (RR1) are not necessary and are replaced by a convention whereby each feature, in each environment, has an unmarked, or normal, value, and a marked, or unusual, value, and where only the marked values need be indicated in the dictionary, while unmarked values are assigned automatically. It is obvious that my (RR1) and the notion of a DICTIONARY LOOKUP represent a less systematic proposal towards the same end, for all the feature values on the right of the arrow in (RR1) are clearly to be considered unmarked. To revise the present work in terms of the theory of markedness, which was not developed at the time this paper was written, would bring about profound changes in the form of almost all rules I have discussed.

45. The [r]-[z] alternation in the conjugation of sein also occurs in the following pairs: frieren 'freeze' - Frost 'frost'; verlieren 'lose' - Verlust 'lose' (obs) kiesen 'chose' - gekoren 'chosen'; Jura 'law' - Justiz 'justice', and -er (comparative ending) -est (superlative ending). The environments in which this change of /z/ into [r] occurs are not clear, and I have formulated no rule as yet to handle this alternation.

46. (28'b) is an exception to the general rule of syncope, (28'c), which drops all unstressed [ě]. This means that syncope does not occur in the environment specified in (28'b). But (28'a) is to be understood as an exception to (28'b) - an exception to an exception. Thus (28'a) gives precisely those environments between two dental non-nasal stops where syncope does take place.

47. A note about the abstract features: features like [±Inf], [±Pst], [±PP], [±Pres], [±3rd], [±2nd], [±1st] and [±Sing] are in essence syntactic, for it is syntactic rules which assign them to stems. Not enough is known about German syntax at present for me to be able to say that these features are rightly or wrongly chosen, but the rules I have set up will not change radically, no matter what the best set of these syntactic features proves to be.

This is not the case with the features [±Stem = PP] and [±Pst = PP]. Four of the phonological rules - ($4''$) Backing; ($13'''$) Past Tense I, (2^{iv}) Lowering and (16) Shortening - depend crucially on just these features. There are two other sets of features which might be tried: [±Stem = PP] and [±Stem = Pst]; or [±Stem = Pst] and [±Pst = PP]. The first of these two alternatives is clearly inadequate, for both Type 1 and Type 2 stems would be classified [-Stem = PP, -Stem = Pst], and it would become impossible to state ($13'''$) in such a way that, by referring to these two features above, /fǐnd/ would become [fǎnd] in the past tense, while /bīg/ would become [bōg].

The second alternative is equally bad, for Types 1 and 4 would merge with Types 3 and 6: both would be marked [-Stem = Pst, -Pst = PP]. This would make it impossible to state, in terms of these two features above, which stems undergo ($4''$), Backing, and which do not. At present, I can see no way of setting up an alternative set of features and rules which would be as simple as the one I have proposed.

ERRATA

p. 2	Rewrite line 11 as [gə̆fēlt] (from /gĕ+fēl+ĕt/)
p. 5, l. 11	e g. → e.g.
l. 13	inf → inf.
l. 16	made → made.
l. -6	phoneme → phoneme.
p. 6, l. 6	comment → comment.
p. 7, l. 14	fällt → fä̆llt
l. -8	'thresh → 'thresh'
l. -6	*heben* → *hēben*
p. 8	Line -3 should contain the form *gelŏschen*
p. 9, l. 4	suceeed → succeed
p. 10,	Enclose material to the left of the arrow in Rule (2) in square brackets.
p. 10, l. -6	ship)' → ship)'[11]
p. 11, l. 11	swell → smell
p. 12, l. 6	1.0 → §1.0
p. 12	The material left of the arrow in Rule (3') should be completely enclosed in square brackets.
p. 12, l. -1	-- [+nsl] → —— [+nsl]
p. 13, l. 15	1.2 → §1.2
p. 14, l. 1	geflogen → geflōgen
	flug → flūg
	ge+flug+en → ge+flūg+en
l. -3	[+usl] → [+nsl]
p. 15, l. -7	'lead' → 'load'
l. -6	*tragen* should be underlined

p. 16, l. 2 [+cns] → [+cns]^{18}

p. 18, l. 3 'throw'^{20} → 'throw'

l. 7 'shear' → 'shear'^{21}

l. -7 This line should read: 'phonetic [ĕ] or [ē̆]'.

p. 20 The bundle of features after the slash mark in (9')
should look like this:

$$\left[\begin{array}{l}\underline{\hspace{4em}}\\ \left\{\begin{array}{l}\text{+Umlaut}\\ \\ \left[\begin{array}{l}\text{+Prs Um}\\ \text{-1st person}\\ \text{+Singular}\\ \text{-Pst}\end{array}\right]\end{array}\right\}\end{array}\right]$$

p. 22 The upper left-hand corner should read

After /ĕ/

rb	lf	f	m^{30}
rf			
rd	lt	š	
rst			
rg		x	k

p. 25, l. -9 [-Prs Um] → [-Prs Um],

p. 27, l. -5 convenience → convenience:

p. 33, l. 13 hielt → hīelt

p. 34, l. 4 /šnayt/ → /s̆nayt/

p. 35, l. 2 brennen → brĕnnen

l. 3 nennen → nĕnnen

l. 16 wissen → wĭssen

l. 17 dünken → dü̆nken

p. 40, l. -1 extinguish → go out

The bundle of features to the right of the slash mark in (17) should look like this:

$$\begin{bmatrix} +et \\ \left\{\begin{matrix} +Pst \\ +PP \end{matrix}\right\} \end{bmatrix}$$

p. 36 The rule after line 3 should be numbered $(13''')$

p. 41 The bundle to the left of the arrow in $(2''')$ should look like this:

$$\begin{bmatrix} V \\ -Reg \\ -et \\ +grv \end{bmatrix}$$

p. 42 The lower half of rule (2^{iv}) should look like this:

$$\begin{bmatrix} -dff \\ -cmp \end{bmatrix} \;/\; \begin{bmatrix} \overline{\qquad\qquad\qquad} \\ -Stem = PP \\ \left\{\begin{matrix} +PP \\ \begin{bmatrix} +Pst \\ +Pst = PP \end{bmatrix} \end{matrix}\right\} \end{bmatrix}$$

p. 43, l. -2 Enclose $\begin{matrix} u \to o \\ \text{ɔ} \to o \end{matrix}$ in curved braces.

p. 46, l. -4 1.514 → §1.514

p. 48, l. -3 /vĕrd/ → /vērd/

l. -2 vĕrd+ĕ → vērd+ĕ

vĕrd+ĕ+ĕst → vērd+ĕ+ĕst

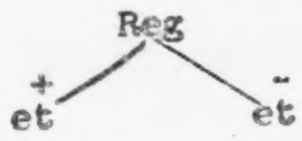
Add the following line to the bottom of p. 48:

(15) vü̆rdĕst

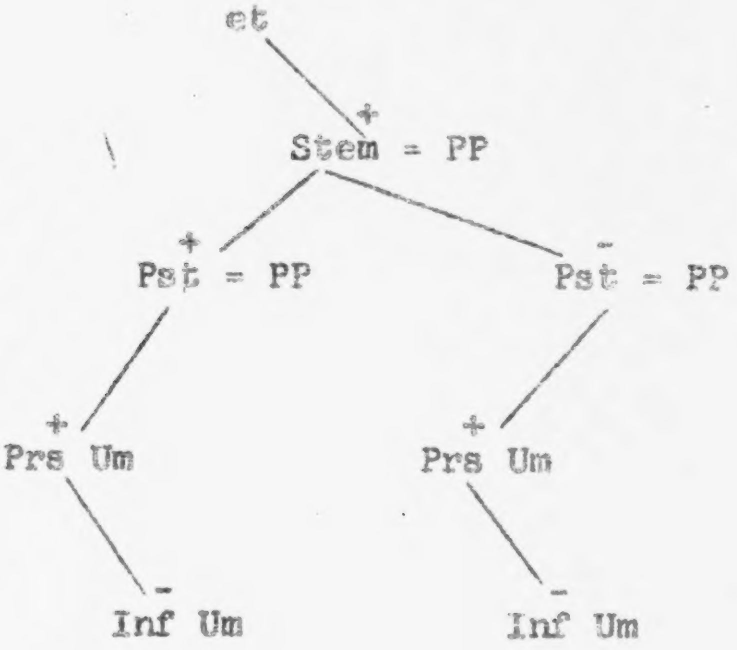
p. 50, l. -7 2.0 → 2.0.

l. -6 (26) → (26),

p. 56 The tree in Fig. 1 contains 2 mistakes. First, the top node of the tree should look like this:



Second, in the left half of the tree, two nodes have been improperly connected. The tree should look as follows:


et
+
Stem = PP
+
Pst = PP
-
Pst = PP
+
Prs Um
+
Prs Um
-
Inf Um
-
Inf Um

p. 57, l. 13	*war* → *wār* *gewesen* → *gewēsen* *ist* → *ĭst* "be" → 'be'[45]
p. 58, l. -11	*lief* → *līef*
p. 59, l. -6	1.8 → §1.8
p. 60, l. -10	*fleugt* → *fleugt*)
p. 61, l. 12	example → example,
l. 13	That is → That is,
p. 64	The left of the arrow in Rule (RR4) should look like this:

$$\begin{bmatrix}-\text{grv}\\+\text{dff}\end{bmatrix}$$

p. 68	The rule called *Shortening* should be preceded by the number '(16)'.

p. 68	The bundle of features to the right of the slash in *Dental Mutation* should look like this: $\left[\begin{array}{c} \underline{\qquad\quad} \\ +\mathrm{DM} \\ \left\{\begin{array}{l} +\mathrm{Pres} \\ +\mathrm{Inf} \end{array}\right\} \end{array}\right]$
p. 71, l. 7	German, → German",
p. 76, l. 5	Insert a left curved bracket to the right of the arrow in this rule.
p. 76, l. -9	/zit/ → /zīt/
l. -1	parts *a* and *b* → parts, *a* and *b*,
p. 77, l. -9	*pflēgan* → *pflēgen*
p. 81, l. -4	27 → 29
p. 82, l. 9	*nimmt* → *nĭmmt*
p. 85, l. 9	1.4 → §1.4